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ABSTRACT

This report presents observations of experts in planning, design, construction or management of tertiary educational facilities about the emerging issues and the appropriate planning and architectural solutions for higher education facilities as the new millennium approaches. Specific topics discuss the current context of tertiary education (postsecondary education) facility issues, including the national objectives and financial constraints that exist. Also examined are the planning and design responses that address campus locations, master planning, facility design for information technology and communications, and space and resource management. Three case studies are provided that illustrate the locating and planning of new tertiary campuses. (GR)

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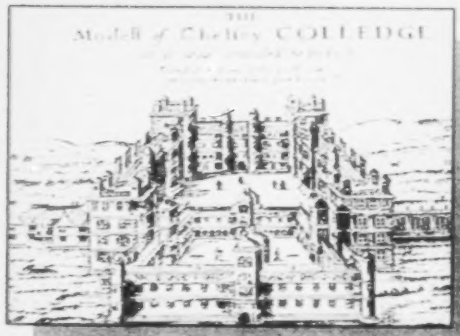
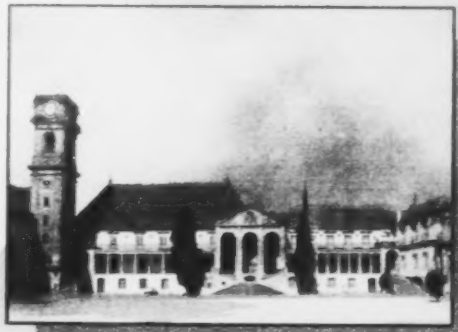
FACILITIES FOR TERTIARY EDUCATION IN THE 21ST CENTURY





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TOWARDS THE 21st CENTURY : FACILITIES FOR TERTIARY EDUCATION

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THE PROGRAMME ON EDUCATIONAL BUILDING (PEB)

Since its inception in 1972, PEB, which operates within the OECD, has promoted the international exchange of ideas, information, research and experience in all aspects of educational building.

PEB's priorities respond to the changing emphases of educational policy within participating countries. The over-riding concerns of the Programme are to ensure that maximum educational benefit is obtained from past and future investment in educational buildings and equipment, and that the stock of facilities is planned and managed in the most effective and efficient way.

The three main themes of the Programme's work are :

-improving the quality and suitability of educational facilities thus contributing to the quality of education;

-ensuring that the best possible use is made of the very substantial sums of money which are spent on constructing, running and maintaining educational facilities;

-giving early warning of the impact on educational facilities of trends in education and in society as a whole.

FOREWORD

This report marks PEB's first study on the question of facilities for tertiary or mass higher education. It draws on the contributions presented at a conference entitled "Towards 2000 : Facilities for Tertiary Education", which was organised by the OECD Programme on Educational Building and the Greek Ministry of National Education and Religious Affairs, at Rethymnon, Crete, in November 1995.

The conference marks PEB's first venture into the question of facilities for tertiary or mass higher education. PEB, in responding to a global refocusing on lifelong learning, wished to satisfy two key objectives :

-to find a means of developing a new business plan for the period 1997-2001 which reflected the needs of lifelong learning. The conference was the vehicle for providing an increased understanding of the emerging contexts of tertiary education, identifying the changes occurring and determining the likely impact on the provision of physical infrastructure in support of the academic programmes;

-to relate its programme of work to the OECD's other educational activities.

At the time of publication of this report, PEB's current programme of activities for 1997-2001 is well under way and these activities have been largely shaped by the conference outcomes. The presentations made at the conference were intentionally of a strategic nature, to ensure the relevance of the observations for as far as possible in the future. It has been released following the publication of the "Thematic Review of the First Years of Tertiary Education - Comparative Report", published by the OECD in 1996.

This report reflects :

-a vision of what constitutes a new learning environment as higher education moves into a new millennium, as seen from different perspectives;

-the responses and the needs in terms of planning and architecture; the emerging technologies and their impact on facilities provision; the management of space and other resources; and some thoughts on the issues to be included in strategic planning;

-how PEB views future work in this area.

It is published on the responsibility of the Secretary-General of the OECD. The views expressed in this publication do not necessarily represent those of the OECD.

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A CAUTIONARY NOTE

It should be noted that the term "tertiary education" is now the OECD's preferred term to describe all formal education beyond secondary education, whether or not it is immediately sequential, on condition that it is of a level which presupposes the successful completion of secondary education or an equivalent level of competence. The OECD describes tertiary education as being "provided in such institutions as universities, colleges, polytechnics and importantly, if less commonly, in other institutional settings such as enterprises and community settings, and it may be either highly specialised and technical in subject matter, or an extension of secondary education. The point of the definition is to emphasise a level or standard and a sequence of studies rather than to specify a particular institutional setting or settings". ("Thematic Review of the First Years of Tertiary Education - Comparative Report", OECD, 1996)

However, readers should be warned that some of the contributors to this collection use different terms to mean the same thing. For example, some use "post-secondary education" to mean tertiary education. Conversely, some authors make different uses of the term "tertiary education". For example, it is sometimes considered to be exclusive rather than inclusive. In this context it refers to non-higher post-school education, that is, vocational further education and adult education. On campuses, the term "higher education" is still common. There it is distinguished between "mass" higher education and "elite" higher education and in some cases is further refined as being "elite" or "super-elite". While respecting the OECD understanding, no change has been made to the terms used by the contributors to this report where their definitions have been different.

The issues under consideration at this seminar were complex and diverse. This was perceptible in both the presentations and the workshops discussions. Rather than to provide a homogenised report which sanitises the cultural and regional differences, it was decided to include the individual papers as an edited collection, ordered in such a way that the report makes coherent reading. However, readers should note that some of the assertions made by the presenters reflect the context in their own country and may not be relevant to other countries or cultures.

1

INTRODUCTION

In OECD Member countries higher education has become, or is becoming, a third or "tertiary" stage to follow the primary and secondary school stages. This development is bringing with it fierce pressures. Within the space of a few years - ten or twenty at most - institutions have been called to accept far more students than ever before. Although there are notable examples of expanding universities able to acquire property in periods of general recession, there is very little capital funding from public funds. Routine maintenance is low on the priorities. Repairs tend to have to become urgent to be taken seriously. Health and safety requirements are more exacting. Students are more demanding. They want longer opening hours for all resources, be they libraries or information technology. They expect high standards in recreational facilities. The pressures are typically seen as horrendous as higher education institutions try, in the colloquial English expression, to fit "a quart into a pint pot", that is to say as they try to do the impossible[1].

These developments can be put in a more positive context of changing functions and societal expectations, that is to say that the system is responding to demands for better training in the service sector and administration as well as in industry and commerce, and that there is also a huge "social demand" for higher education which, contrary to many predictions, has not yet stopped.

In practical terms, however, the present situation is more severe since funding, if not managing, a higher education system has, until very recent times, been seen as an acceptable burden for most developed states. It has been judged to be in the national interest to use public funds to underpin the sector's essential functions in order to help a rising generation to develop its capacities and skills and to support a sector independent of the state with the role of extending the boundaries of knowledge.

As noted by leading writers on the sector : "Higher education nurtures beliefs that the growth and transmission of knowledge are legitimate in themselves, not depending for their right to flourish on stated public demands : that it is a proper function of academic institutions to act as centres of alternative opinions within the political system. This constitutes... higher education's essentialism."[2]

But the fact of higher education becoming a mass activity rather than the perquisite of an elite has changed the contours of the question. This has been particularly marked in the developed economies of Europe and of the Pacific Rim. In terms of funding and management, particularly from a European point of view, the phenomenon is seen at its most striking in the redefinition of the state's role. This is often defined as a retreat. In fact the process is more complex. As Michael Shattock points out in his contribution to this report, the state has tended to withdraw from the management of the system while at the same time increasing its overall control. A space has been opened up for other players - another level of government in the shape of the region or the local community - as well as other sources of funding, ranging from users to almost any source available in the market.

The development of mass higher education to the point where it has become the third or "tertiary" stage has been marked by a second phenomenon, which is observable at the grass roots and is often the source of fierce debate. Particularly clear in the USA and Australia is the interest in the nature of higher education learning. Two strands are apparent. The first is how higher education can be made more effective in a mass context, or how better to master, at an institutional level, the processes of teaching and learning. A key concept is that of "open" or student-led learning. A second strand is how to make best use of the emerging information technologies (IT) and how their presence changes the nature of learning at the higher or tertiary stage. There are some powerful IT examples from Australia, where national development has always been crucially linked to overcoming the problems of distance and which was thus early to see the potential of IT in abolishing a traditional form of "tyranny." Both the debate about open learning and IT have important implications in terms of space and budgets.

So on the eve of the 21st century we are seeing new and unprecedented pressures on higher education institutions and systems as they aspire to retain their "essentialist" character as independent centres of knowledge. Gone is a way of life immortalised for a wide public in novels of university life - by C. P. Snow, Malcolm Bradbury and David Lodge to take just British examples - in which universities appear to owe their survival to the highs and lows of academic politics and that alone. R. Burton Clark's 1983 model of higher education governance as in the hands of an academic "oligarchy"[3] has had to cede to a model which places the market as well as the government in pivotal roles, with the universities in most countries accepting an increasing dependence on central institutional management in place of the traditional dispersion of power to faculties and departments.

A major theme of contemporary higher education reflection is thus how to preserve academic freedom at a time when the loss of an assured income from the state obliges institutions to search for new sources of finance and new forms of management. There has been extensive interest in developing a science of higher education management to fit the new context. OECD has been closely involved. Its

Journal of Higher Education Management, published by the Programme on Institutional Management of Higher Education (IMHE), is a standard reference on such questions.

But the impact of these changes in the nature of higher education on resources and facilities, and the implications for planners and managers of estates and facilities, have merited relatively little public attention. In terms of annual budgets, this may be linked to the fact that the maintenance of buildings and resources is likely to be only a quarter or a fifth of the annual cost of the academic staff of an institution.[4]

The Crete Conference

The OECD's call for a conference to map the terrain in terms of concerns and problem-solving was very much a first attempt to introduce some systematic and trans-national thinking on the issues of buildings and services in higher or tertiary education. The experience developed through the schools-orientated activities of the PEB, some of it in conjunction with the IMHE, provided a frame of reference. The objectives were general to the PEB : developing a forum dedicated to the improvement of the quality and suitability of educational facilities as a contribution to the quality of education; ensuring the best possible use of the substantial sums of money spent on constructing and maintaining educational facilities; and giving early warning of the impact on educational facilities of trends in education and in society as a whole.

Organised jointly with the Greek Government (through the Ministry of National Education and Religious Affairs) the conference held at Rethymnon in Crete in November 1995 brought together over 90 representatives of the professions involved in every stage of higher education building and equipment, from the initial decision to create and locate a structure, through its planning, design and construction to its eventual operation. The conference was also attended by some prominent Greek politicians. The professional participants came from 20 OECD Member countries which are also affiliated to the PEB. The specific task given by the PEB was to undertake an exercise in definition : an examination of trends, an exchange of information on responses and suggestions for work the PEB could usefully do in the tertiary education area.

It is worth commenting on that process of definition since it points to some important conclusions. The PEB set up an initial list of technical questions for conference participants :

- What are countries' strategies for coping with the increase in student numbers? To what extent do they rely on new building? On greater intensity of use of existing facilities? On non-traditional delivery mechanisms?

- In what ways do new information technologies affect the need for, design and use of buildings and equipment?
- Who has a say in the design and planning of new facilities and what norms or standards exist to regulate them?
- What is the value of a campus master plan and how can one best be developed?
- What innovative international experience is available on the management and maintenance of complex facilities?
- How do facilities need to be adapted to meet the needs and expectations of students and staff with disabilities? For those from minority groups? For a "new" clientele?
- To what extent are institutions meeting changing requirements for health, safety and security?

As can be seen from the list, some very obvious issues of concern to higher and tertiary education were not on the agenda. Libraries, for example, are the subject of other PEB work. The questions raised above, however, all received some kind of answer at the conference. In some cases, such as designing access for the variously disabled, the majority feeling was that legislation has now taken care of the issue. It is no longer problematic. In others, the developments which countries or institutions think innovative on the building and facilities front, and their responses to the challenge of change, were sufficiently specific to provide much of the substance of this report.

The technical focus was on the relationship of institutional design to three activities in particular : (i) planning; (ii) management and financing and (iii) information technology and distance education.

The most important lesson to come from the conference, and which runs through these pages, is the centrality of estate issues to the quality of tertiary education on offer, though one might not guess it to look at the average university calendar. Three themes were apparent :

- *The scale and complexity of the estate of a modern tertiary institution* : with its academic and its non-academic areas, which necessarily include space for administration, maintenance and recreation, there is an extensive infrastructure to manage in terms of basic utilities for access, amenity and security. The example of the Australian National University given at the conference stands out. It has five sites, one of which is 600 km. away from the main base, others of which have all the complications of city centre living; 135 buildings cover a diverse range of functions, which include major research institutions, and a total area of 650 hectares.

- *The large number of different constituencies to get a new or extended tertiary institution up and running* : starting with the political decision and continuing through to its everyday exploitation, the managers of higher education estates and services can expect to be in sustained contact with academics, ministry architects and programmers, consultant architects and other representatives of the building professions, IT experts, learning experts - not forgetting teachers and students.
- *The awareness that educational institutions, like those of justice and defence, are at the core of a nation's identity* : whatever the trends to globalisation there are still likely to be political and cultural choices to be made which differentiate one country's institutions from its neighbours'.

These general conclusions overrode professional barriers and also the linguistic differences, with the conference tending to divide into three major language groups : English, French and Greek. No group could escape the fact that there might be shared professional concerns but that there would be culturally divergent solutions. Each group thus found itself needing to think about professional roles in the context of the different key players : the state, the local community, and the institutional community in its different forms. Each also needed to think about the part played by public and private interest.

At a second level the result was an extended debate which focused largely on :

- *The location of institutions and the factors which influence it, with a marked awareness of how in most countries the planning of higher and tertiary education is subservient to wider issues of national or regional strategy.* Similarly, the choice of new building or rehabilitation (e.g. the presence of historic or unused buildings) and the relationship to the local environment and/or community as both a duty and a source of new revenue, were seen within a new kind of political context.
- *Funding strategies in the light of state disengagement and greater institutional autonomy and the relationship to potential funding bodies in the public and private sectors.*
- *The management of information technology and the extent to which it is precipitating changes in teaching and learning.*
- *The more effective management of property and services, including the use of space.* A common concern was how to make buildings with a life-expectancy much longer than most of their users adaptable to new developments and, in particular, how to plan for new technology. It was notable also that there was concern with how to adapt buildings to changes in society ranging from changed perceptions of higher education to changed notions of property and/or security.[5]

An additional and enriching dimension of the conference was the range of professions involved. The questions of common concern were seen from different angles, depending on whether the discussant was, for example, an architect or an estate manager, a national administrator or an educationist, an elective figure or an appointee. It was notable how frequently participants, exhausted no doubt by present pressures, used a vocabulary of "humanist institutions" and more "human forms of learning."

It was also clear that those involved in the planning and management of tertiary institutions are now looking for a two-way shift in attitudes. They recognise, as Lindsay Ames puts it, that facilities planners now require "more than an understanding of the flexibility of buildings for re-adaptation and re-use; they (also) require an understanding of the cultural and educational paradigm shifts needing "built" or "virtual" solutions." At the same time there was a detectable resentment in discussion that too many academics seem uninterested and even resistant to the technological changes which are integral to the provision of services in a modern tertiary education system.

In other words the estates and facilities managers, the architects and programmers all believe that they have been forced by the demanding contemporary context to become sensitised to the vision, or lack of vision, of higher education expressed in national political priorities and academic ideals. As was repeatedly said, these find their expression in the physical structure of a campus. What they are asking is that academics and students become a bit more understanding of the role of those who create and those who operate the physical institution.

The conference ought therefore to be seen as a milestone, albeit one of many, as is the way with milestones, in the debate about the impact of the new phenomenon of mass higher education. For what the conference demonstrated unequivocally was that the professions whose ideas are reflected in the following pages now have a crucial contribution to making this stage of education what it is.

2

THE CURRENT CONTEXT OF TERTIARY EDUCATION

EMERGING ISSUES IN FACILITIES FOR TERTIARY EDUCATION

Do the designers, planners and managers of tertiary education feel themselves to be working in the same context, regardless of professional bent or culture? Or are there specific local contexts to be taken into account when discussing the creation and operation of their institutions? The discussions at Rethymnon suggest that both are true.

There was a shared consciousness of being in a new phase. It was clear that, had papers been put to the conference describing the situation in OECD/PEB Member countries thirty years ago, all would have recognised that the picture of higher education and the professional approaches in the field concerned would have been vastly different, as the other side of the watershed of the late 1960s/early 1970s. Before the high birth rates in Europe in the 1960s, a higher education population of 10 per cent of the age group was the norm as opposed to the figures today, which range between 30 and 50 per cent. Whatever the expenses of laboratories and early mainframe computers, the facilities of a university were rather simpler to manage thirty years ago. Public funding posed no problem. The USA and Japan were the only countries on the world stage at that time to imagine tertiary education as a norm. Significantly their systems worked on a mix of public and private finance. But the expansion of higher education to the point where it may be becoming a tertiary stage and the advent of a global economy have changed the general context profoundly.

Within professions and between cultures there are, however, profound differences. The aim of this section is to show just how differently the contemporary context is perceived depending on the discussant's professional and cultural perspective.

The selection of papers printed here begins at the grassroots with the view of the Head of Estate Management at the Australian National University, Don Hardman, on the problems of running the five sites and 135 buildings which make up a prestigious university with a large number of research institutes. The immediate concern of his paper is a change in funding mechanisms imposed by the Australian government in an effort to control higher education costs. But the

underlying theme which emerges in Hardman's commentary is the extent to which he sees the job as shaped by external pressures ranging from government legislation to changing social attitudes, which have, for example, made security a major concern. In such circumstances, he argues, the most important resources at an estate manager's disposal is the staff, its most essential characteristic is adaptability. Conclusion : an intelligent and adaptable workforce can face the challenges as they come. "Staff are encouraged not to leave their brains at the campus entrance."

Dr. Michael Shattock, registrar of Warwick University in the United Kingdom, and well known for his writings on higher education trends, also comes to the conclusion that human ingenuity can triumph but not without pain for some. "Tertiary education in the first decade of the 21st century will not be a comfortable environment in which to work, but it promises to be quite exciting and we should not take a pessimistic view."

Shattock, whose experience is marked by working in an institution intent on raising its research profile, looks from a basically European perspective at the prospects for higher education in terms of the three driving forces which have been dominant since the Second World War. These are student demand, costs, and research imperatives. Most systems will see 50 per cent of the age group coming into what has hitherto been called higher education. There will be far more older students, particularly women students. The educational objectives of the new student body will be far more diverse. Confirming the line to which OECD has held to since 1973, Shattock says state financing of higher education at present levels is unsustainable. But national governments will remain intensely interested in research funding, tending to concentrate their resources in centres of excellence.

At the level of systems he believes that there will be a shake-out which will produce a widely differentiated set of institutions. At one end there will be tertiary institutions like the American junior college : "Tertiary education will become the widely accepted substitute for higher education." At the other end, he suggests, we will see a super league of world-famous institutions, with a strong research core.

At the level of institutions this state disengagement means paradoxically both more autonomy and more control. "All over Europe, albeit at a differing rate, universities are acquiring increasing control over their budgets, over their capital programmes and over the way they manage themselves in a cost-effective way." But as central administrations withdraw from the financing of the system they impose regulatory mechanisms instead, such as those in the United Kingdom, concerned with academic quality assessment and other forms of accountability.

Autonomy brings with it competition : competition for students, competition for finance, competition for more concentrated research funding. Those managing universities are going to have to expend a great deal of ingenuity in building up an attractive profile to attract new sources of funding and the type of students they want. This may be through integration into the economic infrastructure of the region or other forms of community link, through disciplinary or research specialisation, or by the quality of the university environment including its architecture.

"In an unregulated and competitive market the strongest universities (which will normally be the most research-intensive ones) will charge the highest fees, offer the best facilities and attract the highest qualified students," says Shattock. The others have to develop their individual strengths.

NATIONAL OBJECTIVES AND FINANCIAL CONSTRAINTS

OECD Member countries are going some way down this path. In the USA, Latin America and the Far East, private universities have "flourished" alongside public universities. "There is a growing feeling which has already found expression to a greater or lesser extent in Portugal, Germany, Greece, Sweden and even France that private universities where the institution is supported by donations and student fees... is becoming inevitable."

A new Swedish policy is to transfer all university buildings to a government-owned limited responsibility company, making the universities into tenants, more anxious than they were in the past to save on space. Austria, Finland and Iceland also rent buildings from a state agency. Interestingly, Norway has done so in the past but has since dropped the scheme.

Iceland's funding initiative is to use a lottery. In Canada, universities now have to look to the private sector for funding for student residences, sports centres and other recreational and social facilities. The role of foundations has become important.

But as the Rethymnon conference demonstrated, there is no universal pattern. The French have basically gone for decentralisation, shifting part of the public funding burden onto the local and regionally elected bodies. The existing handful of private universities does not give the appearance of being a model.

In Greece, and the case is unique among OECD Member countries, the state pays for everything including text books and student residences. There may be pressures building up to change the system. But, as stipulated by the Greek constitution, "higher education is public and can only be offered by the state". In Italy higher education institutions in the province of Tuscany receive almost 90 per cent of their funding from public funds. In Hong Kong, though, students pay fees and the government has a reputation for generously contributing to maintenance costs of buildings.

A number of governments which have reduced their financial support nevertheless set limits to the amount of internal competition between the country's universities. They are recognised as having national and regional obligations. Thus the development of the University of Quebec at Montreal (UQAM) is tied to a political commitment to objectives which are at one and the same time educational, economic and social, says Florence Junca-Adenot, vice-rector of UQAM in charge of buildings and finance, and her colleague Jean Roy, director of site planning. These are to increase the level of initial education, encourage continued education, contribute to the development of a region and create a research pole recognisable world-wide.

The extract from the paper by Catherine Chauffray of the architecture division of the higher education section of France's Ministry of Education, similarly underlines national objectives and nationally defined implementation strategies associated with a new - and, as it turned out, a rather brief-lived - framework, an emergency building and extension programme for universities. The initial efforts were notable in a hitherto highly centralised state for defining six models of partnership with local authorities which, under the law of 1983, had been given a large number of planning powers.

The section on national perspectives ends with an extract from Greece's report to OECD on the legislative framework in which tertiary education operates and the government's comment on the state of its premises and facilities.

There remains the question of information technology, an issue all those involved in facilities design and management know to be crucial, while uncertain of some of the contours. In a specially commissioned study for OECD, Renwick, an honorary senior research fellow at the Victoria University of Wellington in New Zealand, has much the same analysis of the general trends in tertiary education as Shattock. But, unlike Shattock, he believes it would be a grave error for those with planning and management responsibilities to discount or downplay the role that IT could be playing in the near future. "It has the potential to transform learning as we have known it in post-secondary institutions."

EMERGING ACADEMIC DEVELOPMENTS IN HIGHER EDUCATION

Michael SHATTOCK, Registrar, University of Warwick, Coventry, UK

People are generally not very good at forecasting the future, unless their name is Arthur C. Clarke, and even he is pretty erratic outside a limited number of technological developments. All the historian can do is forecast on the basis of his view of the past and his estimate of current trends. That, fundamentally, is what long-range planners for industry do, and since higher education is itself a kind of industry – a very large industry indeed judged by its financial turnover and the

number of people it employs – then that is what we need to do. First then, we need to consider the wider context in which higher education operates.

On the whole, no European country is given to radical change, and it is therefore reasonable that we shall see social and political evolution over the next period rather than sharp discontinuities. However, the continued pressure to reduce the size of government, to curtail and roll back the cost of the welfare state, and to rely increasingly on the creation of internal markets to drive government expenditure, does not offer higher education any grounds for optimism regarding government funding for universities and colleges. We need also to remember that neither the oil crisis in the mid-1970s nor the collapse of communism in the late 1980s were anything but immense surprises, and there is no reason to assume that similar international turning points will not occur which may change all our views on what the future may hold.

If we look back at the development of higher education since the Second World War, what we find is that change is driven chiefly by three factors – student demand, cost and the research dimension (although the importance of the latter varies from country to country). Some people would argue that technology has been, or at least will be, a powerful force for change.

Increasing Student Demand

Student demand is a result of continued growth. In the United Kingdom, for example, the proportion of the 18-year-old population entering higher education has risen from about 3 per cent in 1939 to 31 per cent in 1995. In other words, there has been a move from the education of a tiny elite to something approaching mass higher education. In the USA, which reached 30 per cent some 30 years ago, we can see a higher education system which takes in about 55 per cent of the age group. The Confederation of British Industry is forecasting – optimistically many people think – a growth to 50 per cent in the United Kingdom sometime early in the next century. The United Kingdom is not alone in Europe in following this pattern.

What were the institutional and other implications of this rapid rate of growth? The first of course is that many new institutions have been created either by the establishment of entirely new foundations or by long-established institutions founding satellite campuses or by the upgrading or adaptation of existing institutions.

In France, five wholly new universities are being planned to realise the "*Plan Université* 2000", which envisages 100 to 150 000 additional students per year up to the millennium. In Spain and Portugal, many new universities have been established. In the United Kingdom, however, while nine wholly new universities were created in the early 1960s, the expansion has been largely contained by a

process of upgrading non-universities to university status, although some satellite campuses are now being created. Even in these countries, however, all institutions have become much larger. In countries like Germany, where an expansion from 27 per cent to 40 per cent of the age group is planned with no expansion of the number of institutions, and Italy, institutional size has become a significant issue. Since all institutions in all European countries are significantly under-capitalised, overcrowding is becoming everywhere a chronic issue, with its attendant symptoms of high failure or drop-out rates amongst students.

Mass higher education is raising other issues. First, the growth in 18-year-olds in higher education has encouraged a much higher participation from among even older students, so that the student population has become more diverse both in social class and in age. The greatly improved participation of women, particularly mature women, has led to new demands for institutions to adjust to their needs, particularly in respect to support for the care of students' children during teaching hours.

But higher education itself has become more diversified. Not all students study in institutions called "universities" and not all study for university qualifications, so that higher education itself has become more institutionally diversified and much less tidy than it was before. We must assume that "massification" is not reversible and will continue.

If we ask ourselves what the pressure of student demand will produce by the year 2005, we can assume that the student population will be even more diversified than it is now, and the spread of institutions will be greater. More universities will sprout satellite campuses, more new institutions altogether will appear, and US-style community colleges with franchised arrangements with established universities will become much more common throughout Europe (they are already making their appearance in the United Kingdom). The problem of institutional size will, however, become much more pervasive. Anyone who has visited the National Autonomous University of Mexico with its 100 000 students will have appreciated the difficulty of trying to manage an institution so large and with such well-established, independent fiefdoms within it that it has created its own turbulent political environment. We do not have to assume that universities in Europe will take on these characteristics, but the difficulties of managing very large institutions from an academic, financial and physical-planning point of view will become a major preoccupation.

The Cost Factor

Assumptions about the continued growth in student numbers take us inevitably to the second crucial driver of higher education development – cost. Even now the cost of the growth of higher education has outstripped European

The National Autonomous University of Mexico

governments' ability to pay for it. Further growth will simply compound the problem and must lead Europe to look at the solutions that other countries have adopted. In Europe and in the British Commonwealth, it has until now been assumed that higher education should be funded by the state, while in the United States, Latin America and in the Far East, private universities have flourished alongside public universities. There is a growing feeling, which has already found various levels of expression in Portugal, Germany, Greece, Sweden and even France, that private universities, where the institution is supported by donations and student fees or some development along these lines, is becoming inevitable. University overcrowding, concern about the quality of teaching, and the inability of state-funded universities to respond to market pressures are all factors which could produce such a development.

The progress of the independent university centre *Léonard de Vinci* in Paris is, however, instructive here. Founded in 1991 as an alternative to the public university system, and attracting more than one billion French francs from its local council in the wealthy *La Défense* business district adjoining Paris, it also needed to attract FF 500 000 contributions from each of a significant number of businesses and fees of FF 26 000 per year from students. So far, the contributions and student numbers have not met expectations, but its 37 000 square metres of space for 5 000 students has attracted severe protests from students from the nearby Nanterre University which has only 17 000 square metres for its 35 000 students. Private or mixed public and private universities in the United Kingdom, Australia and Germany have also struggled to survive in a climate where the middle classes seem unwilling to transfer to higher education their capacity to pay high fees for education prior to age 18.

If creating a full-blown, private university sector is difficult and financially risky, the alternative is for existing state-funded universities to turn increasingly to non-government sources of income for survival. One such source is student fees. The impact of such a development will be striking because universities will be forced to compete with one another in the private market. In their efforts to attract students, universities will devote more attention to presentation, will refurbish their buildings and will market themselves. In the United Kingdom, where an internal market has been created with public funding, universities are committing themselves to considerable expenditure, including television advertising, to improve their image so as to attract students, both locally and from overseas. It is estimated, for example, that over £500 000 was spent by higher education institutions in media advertising in September 1995 alone to fill their places in October.

One effect has been to encourage many universities to enter the commercial markets to borrow funds for extensive capital programmes, a move which has been given encouragement by the Government in the establishment of a so-called Private Finance Initiative, aimed at encouraging commercial interests to invest in university buildings for profit. One university has entered the bond market with a flotation of £35 million. Lest this should be thought of as a peculiar British aberration, the Swedish government has provided endowment funding to enable Chalmers University of Technology to change its status from being a public to a private university.

We are only at the first stage of these changes but it would be surprising if, at least in the United Kingdom, some universities – and inevitably they will be the most successful universities – receive perhaps no more than 20 per cent of their income direct from government grant within a decade. My own university is a leader in this field and was already only dependent on government recurrent grant to the tune of 43 per cent in 1994/95 without, however, embarking on a programme of charging fees to British undergraduates.

However, it does not take the financial expertise of a sceptical banker to recognise that if you enter the financial markets you can expect to see some financial failures, particularly if the markets are attracting a lot of inexperienced players. It is clear that the more universities borrow money, the more they become reliant on private-fee income rather than on regular, if miserly, recurrent grants from the state. And the more they embark on commercial ventures to supplement state funding, the more we can expect to see some serious university financial failures.

In the United Kingdom we were within days of seeing a university bankruptcy in 1987 partly, but not entirely, for these reasons. In the world of further education (United Kingdom's community-college sector), mergers and closures are becoming an almost daily occurrence because of inexperience and

mismanagement. The finance houses and property developers who are looking for business in the UK higher education sector, and some notable university leaders, believe that politically no British university will be allowed to fail and that eventually the government will pick up the deficits. I am no longer convinced by this argument, which depends on the assumption that a university failure would represent a severe political blow to a government. But in an era of mass higher education where there are many universities and some alternative providers, it seems that governments are in a much stronger position to distance themselves from individual institutional failures.

This is particularly so when one looks at the steps governments are themselves taking to face up to the financial crisis that they know is growing in higher education. British universities have, for historical reasons, always had a high degree of legal and managerial autonomy, even when 90 per cent of their income was funded recurrently by the state. Modern approaches to management in the private sector of the economy are now infiltrating the most Napoleonic of European, higher education systems. In other words, governments are seeing value in devolving powers of self-management to institutions and coupling such powers with the imposition of further inevitable financial stringencies.

In consequence, all over Europe (albeit at a differing rate) universities are acquiring increasing control over their budgets, over capital programmes and over the way they manage themselves in a cost-effective way. Of course, this is provoking complaints about increasing managerialism in universities as academics and students find they have to address their complaints to their own institutions rather than to national or regional governments. But the implications for the future of higher education are profound. Undoubtedly, it will release universities to launch more initiatives themselves; undoubtedly it will increase diversity; undoubtedly it will reinforce institutional image-making : the dreadful habit in the United Kingdom of adopting university logos will become widespread. There are opportunities here for the business community and for the professions in sharing in this bonanza, but whether it will fundamentally improve higher education's products is a more open question.

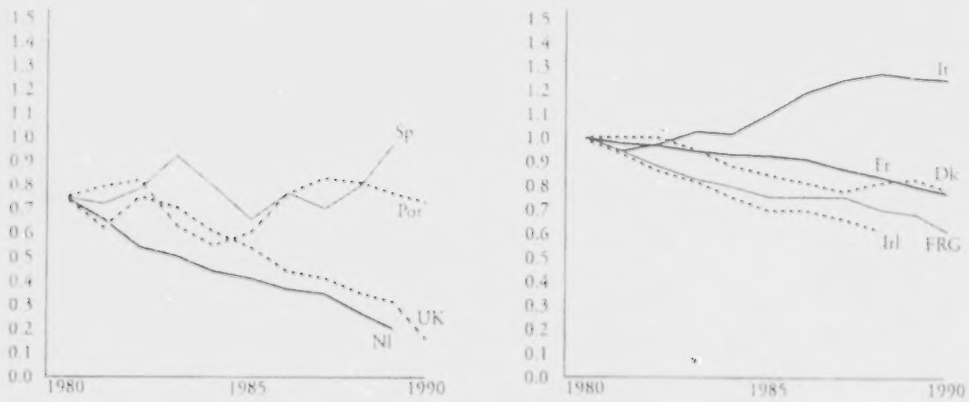
What it will do however -- and this is beneficial -- is that it will broaden the mission of universities. Already, in many countries, we see a strong indication that universities wish to contribute to their local and regional communities; they are keen to play significant roles in industrial regeneration and in extending higher education to elements in society which have previously been excluded. The science park and innovation centre movement has changed the face of many universities' relationships with industry and with entrepreneurs, and a significant number of academics are following the Boston and West Coast practice of establishing small high tech companies while retaining their academic role in the university. More managerial autonomy and greater awareness of the need to contribute actively to the community

– a consequence of recognising the weaknesses in depending too exclusively on the state – are making universities better neighbours and more outward looking. But it is also making them more worldly and in the early 21st century we shall find some which will have become very worldly indeed to survive.

Paradoxically, in this new world, universities seem likely to be pulled in two opposite directions. One of the characteristics of the movement to privatise basic state services is that the state is anxious to impose new regulatory structures on the activities it has allowed to float free. In higher education we can see this particularly in the academic quality assessment movement which is for the most part government driven, and in the demand for greater accountability generally which, in the United Kingdom at least, is adding layer upon layer of bureaucracy on to the university system.

Thus, as universities on the one hand are encouraged to engage with the market, they are simultaneously reined back by audit and other mechanisms which require ever more detailed reporting arrangements. However, pulling in an almost contrary direction is the competition which is growing up with the private commercial market. Increasingly, companies are seeking to offer educational programmes of a vocational kind which challenge the previous monopoly enjoyed by universities. In the United States, many companies are now licensed by accreditation agencies to award qualifications in professional fields while across Europe new private agencies are springing up to offer vocational training in fields in which universities are themselves the acknowledged market leaders. Universities have often been slow to recognise the competition but those that have, have been drawn into head-to-head fights for market share which only too easily can drive both university and company down-market, into costly and self-defeating competitiveness.

Ratio of the change in public expenditure on higher education and the change in enrolment in higher education



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Source: Higher Education in the European Union, European Commission, Brussels, 1994.

Keen Interest in Research

The third and final driver of the higher education system is research. In the United States, there is no question that those universities which most excel in research command the most prestige, attract the most funding and make the most impact on the national consciousness. In the United Kingdom, too, the reiteration of nationally managed, research assessment exercises are having the effect of creating a three-tier or even four-tier university system in which the most research-active universities stand at the apex.

The position is often quite different in other European countries, where the best funded research is often carried out in independent government laboratories and research centres which may or may not be located in universities. Nevertheless, it is clear that, however organised, the research imperative which is often located in the older universities confers a prestige and status not normally available to the newer institutions. This prestige will manifest itself in attracting the best students, in maintaining the largest postgraduate populations and in the scale and style of a university's buildings.

In all European countries, governments are taking a keener interest in research and its possible economic outcomes, and in the sciences and some of the social sciences governments are seeking to play a larger role in directing funding towards particular fields. The British Foresight Exercise is paralleled in France and elsewhere. Indeed, it has been estimated that between 50 per cent and 80 per cent of all research in the advanced industrial nations is devoted to economic, social and strategic goals. The long-term effects of this are difficult to predict, but the signs are that the more research is focused into pre-determined fields, the more likely it is that it will be concentrated in fewer institutions so that what we will see emerge is a group of research-intensive universities which will constitute an elite subset of universities competing vigorously for research grants and contracts on a national, European and even global basis. The emergence of such a group will be reinforced by the impact of massification and the group's ability to attract private funding.

What we shall therefore see is an increasing segmentation in the university market, with a group of universities scattered around Europe pulling away from the rest of the pack. The implications of this, and of their relations with one another and with the state, will be of profound significance for the formation of national elites and the development of learning and international competitiveness in research. One of the benefits, at least within Europe, is likely to be that international co-operation in research will increase and that communication and movement of both staff and students between the research intensive universities will grow. But of course these movements will also be global, especially as the World Wide Web makes communication so much quicker

and more direct between research teams separated by great distance and by different time zones. One other consequence of the emergence of an elite group of universities with a significant degree of financial independence will be their ability to resist the incursions of the state.

The Impact of Information Technology

Reference to information technology in research raises the question of what its impact will be on the higher education system as a whole. It is fashionable to argue that technology is bound to revolutionise university teaching, and some people go so far as to claim that "the virtual university" will even take over from the existing university by the end of the first decade of the next century. I am afraid that I take a more sceptical view. I readily concede that IT will have an impact on teaching in that it offers the prospect of transferring the power to learn and the pace at which that learning progresses much more readily into the hands of the individual student. The number of students owning their own computers which they can plug into a university's local network and thence into a global network is growing exponentially. In universities overwhelmed by student numbers and where neither staff numbers nor teaching facilities can keep pace with the growth in the student population, it will be convenient to rely increasingly on distance learning techniques.

But we should not assume that students offered a choice between face-to-face teaching with the prospect of engaging in dialogue with their teachers and teaching via remote programme learning methods will choose the latter. What is most noticeable in the United Kingdom is that students are unanimous in preferring the former and my assumption would be that in the research intensive universities – which will be able to attract significant outside funding – no effort will be spared to maintain the direct and personal relationship between staff and students which has historically been the hallmark of their teaching methods. I am reinforced in this belief by some remarks in a recent speech by Gerhard Caspar, President of Stanford University, who argued that "the traditional university would not disappear" although "when distance learning alternatives develop that will seem to save families, individuals and the public money, these alternatives will have a profound impact on the traditional college and university."[6]

I am quite willing to believe that IT will revolutionise the way research is carried out in universities but I am much more cautious about its ultimate impact on university teaching. I believe that all universities will use technology in the teaching process but it will remain for the most part only one element in university teaching and not an all-encompassing replacement of traditional methods. In ten or even twenty years' time, we shall still be using libraries, students will still be reading books and writing essays, and faculty will still be

submitting articles to journals in fields that have yet to become fashionable. The cyber-culture remains for me a distant and unacceptable vision for educating students in higher education.

Nevertheless, if I take a rather more conservative view about the impact of IT on the teaching process, my expectation of overall change in higher education is anything but conservative.

In summary, I believe we shall see :

- A continuing growth in student numbers so that most advanced industrial nations will reach an age participation rate of around 50 per cent, with some advancing well beyond this. We are only at the first stage of massification.
- A much more diverse set of higher education systems, each with a widely differentiated set of institutions. Tertiary education will become the widely accepted substitute for higher education.
- An increasing reliance on private funding to make up the shortfalls in state income. No state will be able to afford the size of the system it has created so that, increasingly, the costs will be transferred from government to the student or to his or her parents or extended family. In an unregulated and competitive market the strongest universities (who will normally be the most research intensive) will charge the highest fees, offer the best facilities, and attract the highest qualified students. But the unregulated financial market will put some institutions at risk, and some will fail.
- An increasing competition between universities and the private sector for professional and vocational programmes will lead to some market failures on both sides and it is likely that the private sector may take a significant share of the market.
- A situation where research excellence confers prestige, and research funding becomes increasingly concentrated in fewer universities which emerge as a kind of university super league which both compete with and support one another. Such a group of universities could attain a status in society and an influence in cultural and even political affairs that would be national, international and global in its impact.

Overall, we shall see a much larger, much more stratified tertiary education system with, at one end, community colleges catering for a local constituency, and at the other great universities which in their size, complexity and international character could remind us of the great monasteries of mediaeval Europe. The relations of these universities with the state will probably be as turbulent as the relations of institutions lower in the hierarchy will be compliant. Tertiary education in the first decade of the 21st century will not be a comfortable environment in which to work.

NEW WAYS OF LEARNING, THE USE OF INFORMATICS AND DISTANCE LEARNING

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The best examples of study materials prepared for distance-learning will meet any criterion for the imparting of knowledge. They have come about because the men and women who have devised them have been as much concerned with the way students will most usefully form their understanding of the knowledge, which they must somehow make part of themselves, as with the content of the knowledge itself.

Good distance courses are typically the result of co-operative effort among people who draw on two distinct forms of knowledge : knowledge of the subject and knowledge of the way the content of subjects can, in any given circumstances, be most usefully organised and presented for students to study by themselves with varying forms of assistance.

Inspection of such study programmes shows that the Socratic approach – where students are led into a subject by means of carefully framed questions which are intended to take them to its heart – is standard practice. These approaches, it is important to note, have been developed during the last generation for distance education systems that have depended on low technology – print, post, and local tutors – rather than telephones, computers, modems and telecommunications.

For at least the foreseeable future, the great bulk of distance-learning will continue to use low technology. But regardless of the means they employ, these approaches are properly thought of as technologies of distance-learning.

Such approaches are open to the criticism that, because students must often study in isolation, or because there are unavoidable delays in having assignments returned to them, teaching/learning relations cannot be as immediate and therefore as effective as they should be. Enlightenment can often require a student's urgent question to be answered when it is raised and that usually requires direct personal contact with a teacher or tutor, whether in person or by telephone.

New inventions are, however, making it possible for teachers and students to make immediate connections between information and the complex ideas we call knowledge. Experimental work in the educational applications of hypermedia has the potential to make students active participants in face-to-face teaching as well as in distance modes in ways never before possible.

This they may well be able to do by asking questions through a personal computer while they are attending a lecture or working through a study unit somewhere else – at the workplace perhaps – or at home. Computers can provide anonymity that is not possible with the asking of questions in conventional lecture rooms. Comments and questions (especially questions that students are often too

embarrassed to ask in class because they think that everyone else knows the answer) could be logged by computer and analysed by the lecturer or the author of the study unit.

One of two things could then be done – the lecture/study materials could be revised to clarify the point in question or, alternatively, answers could be provided, stored in the computer's memory, and made routinely available through a programme's "help" function. The hope, in short, is that teacher/learning programmes will be refined and improved in the course of time.

The lecturer's answers to all the likely and, no doubt, many of the unlikely questions that can be asked of the knowledge to be imparted will be written into the courseware and therefore into the teaching/learning programme. Students will have access to content that is better organised and presented and they will also be able to tap into well-honed "help" functions. Learning programmes that can be accessed by computer at times and places of a student's choice have the potential to revolutionise access to teaching of the highest quality. And they would pose an important practical question. Once the teaching is distributed in a programme, will it be necessary to continue offering it in face-to-face settings?

Experimental work along these lines raises a fundamental question about the essential nature of what during the last generation has come to be known as distance education. It shifts our attention from the problems of distance to the concept of guided self-study, with implications for face-to-face teaching as well as distance-learning.

It opens the possibility of nothing less than a paradigm shift in the way that teachers consider the advantages that information and communication technology could offer all students, full-time and face-to-face no less than distance students. Instead of thinking of distance-education modes of teaching as second-best solutions, all teachers must become familiar with the pedagogic principles they express and then ask themselves how far these are or should become part of their personal stock in trade.

Who Will Be the Delivery Actors of Post-secondary Distance Education?

Governments set the conditions within which publicly funded educational agencies develop their institutional policies. Many OECD governments have recently reviewed, or are reviewing, their basic policy stances, with important implications for present or prospective delivery actors in post-secondary distance education.

Different emphases are apparent but there are some common themes. More responsibility is being devolved to the institutions themselves to determine their own objectives and to take their own initiatives to achieve them within broad policy guidelines, making, as they see it, the best use of their funds.

Funding arrangements are changing and, as well as being more stringent, are being related more to each institution's output of appropriately qualified graduates than to its input of staff, equipment and accommodation. Institutions are being urged to become entrepreneurial and to see it as their role to be responsive to changing demands for programmes of study included, as an important motivating incentive, new and still to be formulated programmes.

Students, particularly for graduate and continuing education programmes, are being required to pay all or much of the cost of their courses and this, from the side of consumers, is intended (amongst other things) to exert a market discipline on the producers of such courses.

Some governments are removing barriers to private sector initiatives on post-secondary education and training; some as a matter of policy are encouraging private providers to compete for contracts with public institutions. Long-standing distinctions between public and private sector spheres of activity are being removed. Protected monopolies which public institutions have traditionally taken for granted are being transformed into markets in which public sector institutions will be competing with private sector interests and also – and perhaps more importantly, with each other.

To the pressures for change coming from governments are to be added those arising from changing enrolment patterns, the new forms of education and training to be provided, and the pervasive influence of new forms of technology. Few post-secondary institutions can remain immune to these pressures and influences, and by no means all of them can be assured of a continuing place in the sun. Some could find themselves merged with, or taken over by, other institutions and, as times goes on, their teaching missions might be broadened or changed altogether.

There has probably never been as much institutional ferment in post-secondary education and training as there is now. This does not so much concern changes of status as, for example, when a polytechnic becomes a university, as of changes in the way institutions are relating to each other under new operating conditions.

More important for providers of distance education are the new kinds of relationships that are beginning to form between institutions and other organisations and agencies. These can best be thought of as strategic alliances. They are contractual arrangements that institutions enter into to protect or advance mutually agreed objectives. They are becoming as important for existing as for prospective providers of distance education. All forms of organisation have inherent problems, of course, and it is as well to note as an aside that consortia and strategic alliances are not always assured of success.

The following examples illustrate some of the different sorts of initiatives that are now being taken in various countries :

- The National Technological University (NTU) in the United States is a consortium of 45 graduate engineering schools. From its headquarters at Colorado State University it contracts with particular faculties to offer courses by interactive video and arranges for them to be transmitted in real time to students who will be widely dispersed in North America. Students are enrolled in the school whose programme they are taking, meet its requirements and receive its qualification. The financial arrangements are advantageous to students, the universities in the consortium and to NTU.
- The Open Learning Foundation (OLF) in the United Kingdom is a British response to new opportunities for open learning in advanced academic and technological fields. It is also a response to government policies to increase enrolments and to reduce unit costs. The OLF is positioning itself in an important niche in a national system that can be expected to increase the range and volume of distance courses. It does not enrol students : it draws on the intellectual resources of more than 20 universities to provide academic and professional services to university administrators and teachers who are delivering open- and distance-learning courses within their own programmes of study.
- The Open Learning Agency of Australia (OLAA) was established in 1993 as a radically different way of delivering distance education within the wider context of open learning. The Agency is a consortium headed by Monash University in association with other leading dual-mode Australian universities and the Australian Broadcasting Corporation, with initial funding from the Commonwealth Government and other contributors. The OLAA will not award its own degrees but will facilitate access for people living anywhere in Australia to the courses and qualifications of the member institutions of the consortium.
- The National Distance Education Centre, based at the Dublin City University in Ireland and under the auspices of the Ministry of Education, is a consortium which draws on the resources and expertise of universities and other post-secondary institutions. It provides study programmes for people who are unable to attend face-to-face courses or who are seeking a second chance to study at post-secondary level. Its recently launched degree in humanities, for example, was designed and credited by six universities. The students taking it follow a common programme supported by the Centre and receive their degree from the university in which they are enrolled.

- New Zealand, another small country, has abandoned the use of centrally developed, national solutions. Time-honoured policies based on government regulation have, since 1989, been replaced by policies that require institutions to manage their own affairs in an environment which they are to assume to be competitive. Institutions that had previously not taught at a distance are making exploratory forays (limited by funding stringencies) and are developing working relationships with telecommunications and broadcasting companies. Telecom New Zealand has constructed its Telelearning Network as a national (and international) electronic infrastructure to be used to link sites for the purposes of interactive learning.

Other initiatives stem from governments that have policies for stimulating entrepreneurial activity through tenders from public sector providers competing with each other and with private enterprises. In many countries this is becoming a standard way of managing and funding the provision of training within industry. Similar initiatives are being taken by large enterprises. They define the educational and training objectives they want to achieve for their workforce, tender for them and award contracts to the institutions or enterprise that best match their requirements of quality and price.

How far private sector enterprises will make inroads into the post-secondary education "industry" is an open question. The potential for "market penetration", particularly in populous countries and in those that share common languages, appears to be considerable.

The demand for non-university post-secondary education and training and for continuing professional education will be very great. In most OECD countries these fields are comparatively less well developed than university programmes for undergraduate study. They are the focus of intensifying professional and government interest.

One way or another, more public money seems certain to be directed towards them and many countries are using funding mechanisms that encourage private sector enterprises to become involved. Again, telecommunications hold an important key to the future. They make it possible for students to become members of learning networks while remaining in their workplaces. They also make it possible for members of a dispersed teaching faculty to communicate with each other, to collaborate in the development of teaching materials and take part in teaching programmes without being physically present.

In countries where post-secondary education and training is being deregulated there is in principle no reason why projects that lead to the development and delivery of educational "products" should always be initiated by educational institutions.

The field is opening for other agencies and companies to mobilise their own strategic alliances which would enable the buying in of their own educational expertise. Publishing and broadcasting companies have done this in the past. With the convergent interests that telecommunications, computer and publishing companies now have in educational markets for self-study courses, an increase in the number of private sector providers of distance education seems more than likely.

The scene is thus being set for a vast increase in institutional networking, with much more scope for entrepreneurial activity in post-secondary education and a blurring of earlier distinctions between public and private sector approaches. Among other things, this raises questions about the regulation of post-secondary education under conditions where there may well be many more delivery agents competing with each other under market conditions.

Governments are under increasing pressure to constrain the costs of post-secondary education. But they also have obligations to their citizens to maintain sound academic, professional and vocational standards. Students who feel they are being "ripped off" can also use electronic networks to register their protests or engage in political action. The idea of a "bill of rights" for distance learners is being discussed in some countries. Is it to be *caveat emptor* or are the providers of post-secondary education to be required to meet and maintain specific standards of performance?

THREE PERSPECTIVES

Quebec

In conjunction with the Department of Higher Education, UQAM developed an overall plan, adopted in 1986, for "the campus of the year 2000". The campus of the year 2000 will be functional but have a human face. It will be people-centred and place the student at the heart of all activities. Everything will be organised to make it a pleasant and efficient place for studying, working and living. The campus will promote academic and management partnerships with the society UQAM serves. It has been planned on environmental principles and incorporates innovative measures such as the use of non-toxic materials, air quality techniques, recovery and treatment of waste, and flexible and adaptable structures.

The campus of the year 2000 will be fully served by a fibre-optic network and a computer network giving access to all data banks. Technology will be chosen with a view to the needs of the university in 2050 as regards access to international data-distance learning methods and the development of distance research.

France

France has seen two major increases of its university population during the post-war period. In the decade 1960-1969 the student population almost tripled, growing at a rate of 12 per cent per year. Thereafter growth slowed, dropping to 3 per cent during the 1970s. This slowdown continued until 1988. Between 1988 and 1991, the number of students increased by between 60 000 and 80 000 per year, that is, between 6 and 7 per cent. In some universities, the annual increase surpassed 10 per cent.

It was clear as early as 1971 that the space capacity was no longer meeting needs. Approximately 50 000 m^2 were constructed each year. A rapid and large-scale collective effort was called for.

Following the elaboration of a partnership between many different actors and decision-makers, in 1990 the "*Plan Université* 2000" was created. This partnership has had major repercussions on the university network, especially as regards the siting of facilities, and the type of links between the towns and cities and establishments of higher education. Whereas the national government previously had exclusive responsibility for the construction of higher education facilities, as of July 1990 local authorities could also take responsibility for construction projects.

The "*Plan Université* 2000" is a five-year investment plan negotiated between the state and the regions. Between May 1990 and May 1991, a region-wide and then nation-wide strategy of consultation involved all partners who could play a role in the future of higher education : the state, the universities, the local authorities, and other socio-economic factors. For each of the 26 regions in France, development plans were elaborated which included population trends, economic-development trends, and fixed-space needs as well as their accompanying infrastructure.

The objectives of the plan were :

- to accommodate, in better conditions, at least an additional 300 000 students;
- to adapt higher education to the needs of the economy by strengthening all levels of qualified training and in all higher education structures;
- to support territorial development within the context of regional development strategies;
- to prepare for the increased competition that is expected to result from European integration.

In practice, the "*Plan Université* 2000" has led to :

- a major increase in the number of *instituts universitaires de technologie* (which offer two-year programmes following the high school diploma);

- the creation of seven new universities, meant to take some of the pressure off the urban centre of Paris as well as to rebalance the university "map" to the advantage of the Northern and Western regions of the country;
- the creation of European centres of development.

The state and the local authorities contributed almost equally to the plan's FF 32 billion budget for the period 1991-95. A new generation of contracts for the period 1994-98 has been agreed which included FF 22 billion in new building projects and university facilities. An assessment procedure ensures that projects fit with national, regional and local strategies for higher education and research. The assessment is meant to encourage the institution to become fully involved in defining the project from a global perspective, taking into account technical factors such as the choice of site, teaching objectives, and human and financial elements. Such an analysis allows educational needs to be better covered on a national level.

In response to new growth in student numbers, new regional plans will focus priority on two areas : the reinforcement of existing sites, which generally favours middle-sized cities, and the expansion of distance learning, which may meet the needs of people spread over a large area.

Greèce

Greece has adopted the international model for higher education suggested by UNESCO, thus offering two main types of learning institutions for tertiary education : a) universities; b) non-university type institutions.

There are no private universities or private technological educational institutions in Greece. As stipulated by the Greek constitution, higher education is public and can only be offered by the state. A number of private schools offer courses in post-secondary education but their degrees are not recognised by the Greek state.

Recent expansion has had natural consequences on the demand for premises and facilities. From a rough estimate of the existing facilities for universities in 1982, it can be concluded that employed built area came to 365 000 m^2. The student population of 92 174 results in a gross ratio of 3.9 m^2 per student. Another survey from 1990 estimated that the employed gross floor area had risen to 1 729 000 m^2 which corresponds to a gross ratio of 14.7 m^2 per student, with 117 769 students at that time. In the space of ten years an apparent increase of 1 364 000 m^2 or 370 per cent for university facilities can be observed.

These increases involved the extension of existing facilities, the construction of completely new ones, and the refurbishment of existing buildings of architectural and/or historical interest. Concerning the TEI's facilities it may be

noted that, on the whole, their premises (which consist of large complexes on the outskirts of urban centres) were constructed during the 1970s and in the following years were enlarged. New complexes were also constructed.

The establishment of new institutions all over the country involved a host of critical decisions and challenges, some of which involved the following :

- *Decisions had to be made about the locations of the institutions*, which were either to be established completely in one area (in the form of a campus or as individual buildings integrated with the urban fabric) or allocated to different locations (for instance, islands or towns within a specific region); this was done by separating groups of departments or faculties. For example, the University of the Aegean has located its departments on various islands of the North East Aegean : the Faculty of Social Sciences on Lesvos, the Department of Business Administration on Khios, and the Department of Primary Education on Samos. The Democritus University of Thrace has established the Faculty of Law in the town of Komotini (Nomos Rodopi), the Faculty of Engineering in the town of Xanthi (Nomos Xanthi), the Faculty of Medicine and the Department of Education in Alexandroupoli (Nomos Evros) and, in between Komotini and Xanthi, the Departments of Physical Education and Athletics.
- *Certain challenges involved the conservation of "heritage" buildings* through their acquisition, refurbishment and modification to modern university functions. Many new universities have re-used architecturally and historically unique buildings in Crete, Thrace, and the Aegean Islands. Occasionally, the character of the building suits the discipline housed there. In the case of the Ionian University in Corfu it was suggested that the Department of History could be accommodated in the former English Hospital built in 1836 during the English rule of the island, while the student library and offices for the teaching staff would be housed in the former English barracks for officers. Interestingly, the University of Thessaly adapted former industrial buildings from the town of Volos for use as its Faculty of Production Sciences.
- *Theoretically, there are socio-economic advantages* in the relation between higher education institutions and the development of an urban centre. Often, the reality proves to be complex. For example, if the student population faces unsatisfactory socio-cultural provisions in the local area and at the same time allows for non-regular attendance (as is normal for the Humanities), then students tend to stay in the town itself only during exam periods.

There are problems with starting up these huge enterprises during a period of financial crisis and limitation, as has recently been the case. Such constraints
40 have been reduced by the influx of European Union funding and the possibilities

of new legislation. In addition, the situation is helped by allowing higher education to start their own enterprises and using their expertise and new technologies in conjunction with local and international industries and firms.

THE CHALLENGE TO ESTATES MANAGEMENT

Don HARDMAN, Head of Buildings and Grounds Division, Australian National University, Canberra, Australia

A number of factors can be identified which make up the challenges which facilities managers face and which will continue for the foreseeable future. Most are out of the control of universities, representing external forces in the economic sense which nevertheless profoundly influence our daily lives as members of the tertiary education community.

Statutory Requirements

A major problem facing facilities managers is the effect of Occupational Health and Safety (OH&S) legislation in all its ramifications. Buildings constructed under the relevant legislation are no longer considered fit places to work given modern day standards of lighting, ventilation, acoustics, etc. Consideration of the needs of disabled students and staff with equal opportunity for access is a concern and the allocation of priorities between competing projects given limited funding is very difficult.

Other legislative changes to building codes in general include :

- the upgrade of electrical installations to present day codes of practice;
- upgraded standards of treatment of waste with the need for neutralising pits;
- conservation practices for waste usage, with concomitant penalties for non-compliance.

Energy Conservation

Energy audits of buildings can yield reports on remedies and early payback of costs of modification. Some buildings can become "out of tune", e.g. fans not cutting out, heating controls not efficient due to inadequate preventive maintenance procedures as a result of lack of funds, whilst others simply do not reflect modern construction technologies. These include insulation strategies and siting orientation for solar efficiency in both the positive and negative effects of the sun's power. Under this heading, consideration must be given to the conservation of natural resources, particularly in Australia regarding the excessive use of water.

Backlog Maintenance

Changes in government funding policies can have downstream effects on maintenance or refurbishment of plant and building fabric. A recent pilot study at the Australian National University on three buildings of differing design, age and usage revealed that these empirical findings, when extrapolated across the 135 campus buildings, resulted in a perceived need of some A$ 35 million in backlog maintenance. In fact, at present, funding constraints have meant that all resources are being applied to corrective maintenance, i.e. breakdown repairs, with little or no funding for preventive maintenance.

Refurbishment

Whilst the "nice-to-have" changes under this heading are not to be ignored, the major headaches come from the requirements of information technology, changing values and social norms. Where the temperature variations between Summer and Winter, and the diurnal variation in each season require both heating and cooling by whatever method, inadequate temperature control in older buildings is emphasised when these buildings are extended.

Information Technology and Communications

Provision of fibre optic networks to buildings and internal local area networks (LANS) is expected in all new buildings. Furthermore it is a requirement that existing buildings be retro-fitted with networking capabilities.

Life-cycle Costing

Life-cycle costing is a "theoretical essential". It is considered theoretical because, in practice, funding constraints are such that it is impossible to set aside sufficient funding to provide maintenance for the next five years, for example, let alone the projected life expectancy of the building.

Other maintenance strategies, such as lifetime contracts for maintenance following construction by the method known as DCFM "design, construct, finance and maintain", depend upon an unchanging usage of space. Some institutions cannot easily follow this strategy because many departments can have major location shifts with further relocations possible.

Teaching and Learning Changes

Apart from the future impact on the design of libraries (and learning centres), with the escalating use of IT for access to journals and reference texts, the use of IT for teaching purposes will continue to have an impact on both design of future spaces and rehabilitation of present information resource areas. Similarly, the

move towards home offices impacts on space and refurbishment considerations.

The increasing use of video conferencing with interactive remote attendance at lectures, together with "distance" learning (defined as any space between learning centre and student) will influence current and planned usages of space and traditional enrolments. IT as a learning tool is also influencing building design because of the need for students to access terminals outside traditional learning hours.

Social Changes

The proximity of institutions to the central business district coupled with open campus designs of the 1960s and 1970s almost encourages vandalism by persons with no affiliation to the campus. More serious is the result of the changing social values of students who have little respect for one another's property.

The increase in crime of all kinds is a disturbing trend. Theft, ranging from stealing motor vehicles to theft of personal items, is on the rise as are physical assaults and sexual harassment of all kinds. The need to retrain security staff, whose major concerns were formerly for physical property, towards the protection of persons and dealing with disturbed individuals, has been necessary for some time.

Transport Strategies

Automobiles and public transport have a major impact on campus design, in particular, due to the need to provide for specially designed car parking structures. There is also an effect on the design of internal road systems and plans for internal bus services.

Some Suggestions for Solutions

The answer is not a simple one of funding, although an increase in financial resources would ease many problems of maintenance backlog. More funds would also allow for programmed maintenance and life-cycle costing to stave off the future calls on scarce maintenance dollars. Other strategies might include :

- Both computer-based facilities-management information systems allowing a good analysis of job activity, and planning for more effective resource allocation, are imperative.
- There is also a need to improve the effectiveness of our most important resource – our staff. Staff cannot, for the most part, work harder – they must therefore be encouraged to work smarter. It is vital to harness the knowledge, training experience and initiative of all individuals in the

facilities-management team. It is also important to include all interested university staff, not just those in the facilities-management field or in urban planning activity.

- The involvement of the campus population in urban design reviews and master planning can be begun by the formulation of precinct teams which will work with the urban design consultant.
- At the "micro" level, the staff in the facilities management division of the university should be encouraged to become involved in all aspects of the section.
- The introduction of "total quality management" and "quality service" can be met with mixed enthusiasm but has been shown to be increasingly accepted (interesting projects at the ANU have been the external client survey and the internal "waste" analysis in which staff perceptions and ideas for improving efficiency and effectiveness were sought in confidence). Suggestions for further analysis can be pursued by continuous improvement teams.

Staff should be encouraged not to leave their brains at the campus entrance. There is a need to make optimum use of our human capital and encourage all to work to the maximum of their knowledge and ability. In this way a more contented staff and a more effective application of our major resource can be achieved. This needs to go hand-in-hand, of course, with more campus community involvement and then "ownership" of projects rather than have outcomes imposed on staff and students.

Of equal importance is the need for funding authorities to recognise that the capital building stock is decaying rapidly and unless additional funds are provided for preventive as well as corrective maintenance, there will be serious consequences for the provision of tertiary education and research in the future.

3

PLANNING AND DESIGN RESPONSES

OVERVIEW

So what are the responses of those involved with higher education facilities in a context in which higher education is effectively becoming tertiary education, i.e. the norm for very large numbers and a very diverse range of students? We may deduce from the previous section, while the most immediate concern of those who are concerned with higher education facilities is likely to be finance, the issues on which professionals are most likely to most want to exchange information and learn more are (i) trends in the location and design of new or extended tertiary institutions; (ii) the strategy and master planning process; (iii) the significance of IT with an understanding of how it affects teaching and learning in ways which have implications for space; and (iv) space management and the more effective use of resources.

Choosing a Site for a New Campus

There is no doubt that, with expansion, the siting of new and extended tertiary institutions has become a highly political issue. Excepting the UK, regional and local authorities have pressed the case for the economic and cultural generator which a new institution brings. Most governments seem to have relished the political opportunity implicit in such decisions.

Many examples of a location chosen to aid urban and rural regeneration and the rehabilitation of heritage buildings are quoted here. Other than in North America and the UK, "there seems to be a tendency with the move to greatly increased student numbers for ever smaller regions and towns each to want its own university or at least part of one."[7] But it would be an error to forget, especially in those countries which accord significant autonomy to their universities, that the market may also offer opportunities.

The backing of the provincial government of Quebec for UQAM is linked to urban regeneration in a French speaking area of Montreal which was hitherto a poor relation to the big English speaking University of Montreal. In France, too, there are small regional universities of the sort Kenny cites, though the objectives

cited for location underline several objectives. Greece, also, has several objectives but for one of the architects involved the key concern "is a creative and fertile interaction between the university community and local society." Hence the University of Thessaly has been able to benefit from being integrated "into the small, formerly industrial, city of Volos, Larissa being 60 km. distant". In Volos, a factory warehouse has been converted for university use and a fine building owned by the Bank of Athens has been transformed into the university's central library.

But, in contradistinction to many of the examples from North America and Europe where a 1960s and 1970s "green fields" policy has been abandoned in favour of a return to the town, Greece's emphasis is on rural regeneration and providing coverage for the national territory. It aims both to provide counterweights to the huge and crowded urban universities of Athens and Thessaloniki and to give a new dynamic to small towns since every Greek university bids for students from all over the country.

With the Universities of the Aegean, Thrace, Corfu and Crete, the extensive programme of university creation - aided by the cohesion funds of the European Union - has given priority to the islands and the mountainous regions at Greece's frontiers. In pursuit of the regeneration objective, faculties have been purposely split between strategic sites. The island of Crete's three prefectures at Heraklion, Rethymnon, and Chania are each host to faculties of either the University of Crete or (at Chania) the Technical University of Crete. The University of Thessaly at Volos is the exception to the rural pattern.

As the French contribution to the conference underlines, government cannot, however, act on the basis of a single criterion such as the geographical location. In some cases the best strategy is to intensify use of an existing site, in others to site new institutions where a region has been hitherto badly served.

It is suggested that the difference between a successful and a less successful siting hinges on the capacities of those involved and the effectiveness of their planning and management. In the example of Cergy-Pontoise, Chauffray singles out the common understanding by the university administration and local councillors that exceptional efforts were needed to put the Cergy new town on the map since it was off the new Europe-wide transport links. The local authority commitment and a financial generosity - above the partnership norms - launched the new university off to a particularly propitious start.

In the case of Lyons there has been an effective "return to the city" with the rehabilitation and adaptation of a famous industrial building, the state tobacco manufacturing company. But in the case of the University of Grenoble, where new building had become necessary, there would seem to have been a disaster. It seemed that the authorities had acted with generosity and a concern for quality

which would enhance the university's image. But the pioneering decision to launch an international architectural competition turned out to have been taken without many of the practical problems being cleared out of the way - including its financial and legal feasibility and its effective meshing in with the university's own development programme. There was no way the expectations raised in the winning design could be realised.

In the case of UQAM in Quebec the university, in co-operation with the provincial government and the city authorities, took the decision to locate the much needed new campus in a run-down area on the East and French speaking side of Montreal. In order to promote urban and economic development it was also to be located close to an important underground intersection. Great efforts were to be made to involve the local community.

Master Planning

The new context demands initiative from all those concerned with university buildings and equipment, and from architects especially. New buildings are needed, prestigious old buildings need transforming or existing sites need new solutions.

All the signs are that quality building has become a pre-requisite. Whether because universities and other institutions of higher education find themselves in competition or because new financial partners are involved or for reasons of local pride, the situation represents a new and promising situation for architects.

That said it also has its dangers. "Too many campuses have been pockmarked by exhibitionist pieces of architecture."[8] Another frequent complaint - voiced insistently in France - is that surrounding spaces are too often neglected. The management of universities' open space has been slow to develop. This is seen as part of a general problem about the place of such issues in master planning, and the opportunity for the relevant professions to intervene at the time it is useful.

The case studies detailed here - the "Campus of the Year 2000" project in Quebec, the "*Plan Université* 2000" in France and the master plan for the Aristotle University of Thessaloniki show how such challenges have been met in very different circumstances. Anastassios Kotsiopoulos, lead architect for the Thessaloniki programme, gives an account of a two-fold process : of the need, as he puts it, "to repair" buildings which were originally designed to face one way but, due to changes in the surrounding landscape and the creation of new buildings, have their blind sides on view; and of a dramatic solution to space shortage, that of building underground. Currently under construction, these underground buildings will provide almost 30 000 square meters of underground space, including a new building for the main university library.

Part of the interest in the current context is that the project demanded a reversal of normal planning procedures. The requirement on the planners was to respect "the urban structure of the campus, of its topography and built" scope. So, instead of a linear planning procedure which follows a normal path from the schedule of accommodation to the final building, a quasi-typological planning process was applied, starting from idiosyncratic building types defined by barriers and limitations.

But ultra-sophisticated and extensive IT may make it unwise to think simply in terms of buildings for a university. In one of the discussion groups Kenn Fisher, partner for educational planning of the Australian architectural and planning consultancy Woods Bagot, described how an old airfield in Victoria has become a fifth campus for Monash university. It was planned in conjunction with the needs of an expanding regional centre and one of the country's important distance learning and vocational training institutes (TAFE). The university was, from the start, committed to joint ventures with its existing distance learning network and the local community. These include delivering associate diploma courses with TAFE. The new campus provides a focus for the programme delivery for distance education programmes. The equipment to be built in includes space-demanding tele-theatres, video-conferencing and a "cyber-café" . Extensive computer 3D modelling was used in the planning and design stages.

The need for careful selection of all equipment at the design stage should not be forgotten either. Very little has been written about this. "Experience of decades in constructing and equipping specialised buildings has been recorded in only a few books world wide" in the view of one expert.[9] Long experience suggests that only if thinking about equipment is incorporated in the initial planning stages will it be possible to avoid the numerous problems that arise at the fitting stage. In addition "preliminary thinking raises safety standards and saves public funds."

LOCATING AND PLANNING NEW TERTIARY CAMPUSES - THREE CASE STUDIES

CAMPUS REQUIREMENTS TO THE YEAR 2020 IN QUEBEC

Florence Junca-Adenot, Vice-Rector for Administration and Finance and Jean Roy, Director of Planning, UQAM

In 1969, as part of the reform of Quebec's educational system, the provincial government decided to set up the University of Quebec, consisting of eleven centres spread across the province. The largest, the University of Quebec at Montreal (UQAM), was established in the heart of the city.

UQAM began with an intake of 8 000 students in 1969. It quickly became very successful in terms of student numbers, reaching 22 000 in 1978. In response to this growth, the University rented old-fashioned office and factory buildings across Montreal, without following any functional logic. In 1976, in order to reorganise and replan its campus for the long term, UQAM prepared its first overall development plan.

In co-operation with the provincial government and the city authorities, the university decided to locate the new campus in the French-speaking Eastern side of Montreal, to promote urban and economic development in that run-down area. It was to be a true city university rather than an intramural one. The campus was to be located around a major underground railway station, so it would be fully accessible by public transport.

The first part of the complex (phase I of the campus : 75 000 m^2 gross floor area) was innovative in several respects. It reflected contemporary educational methods and used space to promote working in small groups, the exchange of ideas and a multidisciplinary approach. The complex incorporated shops at street level to maintain the urban fabric, and protected the historic buildings sheltered within its walls (the *Chapelle Notre-Dame* and the *Clocher Saint-Jacques*).

However, when phase I opened in 1979, UQAM, a victim of its own popularity, was already too large for the premises. In response to this unexpected growth, the university decided to reassess its accommodation requirements for 2000-2020, and to solve the problem of the dispersal of buildings which had re-emerged. In conjunction with the Department of Higher Education, UQAM developed an overall plan, adopted in 1986, "The Campus of the Year 2000".

Pavilion of the Sciences of Education

Pavilions of the Sciences of Management,
Administration and Music

It is a huge integrated and comprehensive urban campus on two sites, now being linked, over 275 000 m^2 in gross floor area (around 3 000 000 square feet). The Western site, to the North of the *Place des Arts*, houses the Science Faculty, while the Eastern site contains the university's five other academic facilities (theatres, student accommodation and the sports centre), around Montreal's main underground station, Berri-UQAM. The campus is served by *Boulevard de Maisonneuve* and *Ruelle Boisbriand*.

By the year 2000, UQAM will have reorganised its activities and built its campus, offering its 42 000 students, 4 000 employees and the community at large the training, research and expertise which society expects of it.

The building of the campus is the largest scale city planning operation Montreal has seen over the last fifteen years. The architectural styles chosen respect and strengthen the urban fabric; green areas have been created; buildings are not too high; the university complements existing buildings and functions and has re-introduced those which had declined in the district, particularly housing. The architectural heritage is preserved throughout. The architects chose to restore and integrate features of historical value in the new developments.

UQAM has taken advantage of its location around the underground station to develop a pedestrian network with underground services linking all its buildings. UQAM is the driving force of Berri, the old Latin Quarter, and has formed an innovative partnership with cultural, commercial and institutional bodies in the district through a development company, the aim of which is to develop and manage the cultural hub of Montreal.

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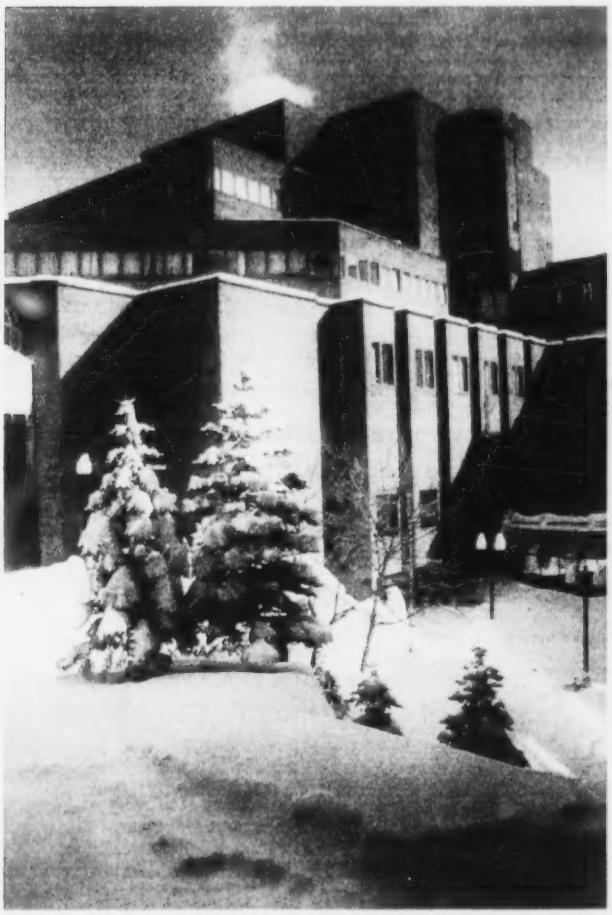
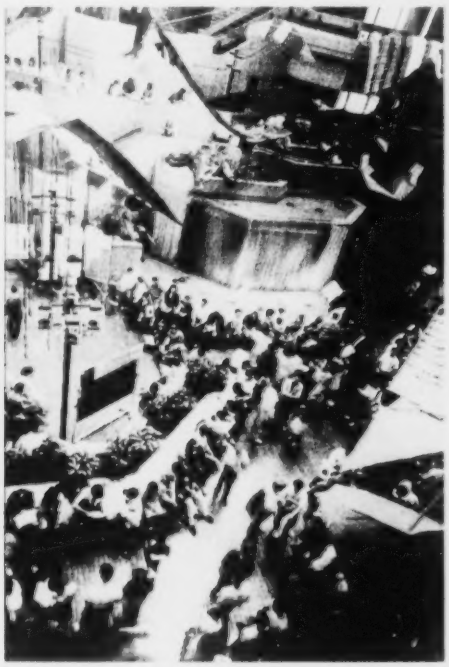
Developing the campus is a twenty-year project (1980-2000). Costing in the region of C$ 350 million, it has called for innovative and unconventional means of financing. The government is funding the academic facilities : UQAM was authorised to build the new campus by drawing down its rental appropriations and gradually terminating its leasing and rental commitments (C$ 287 million). Shops, car parks and housing are self-financing, through loans raised on the market and repaid by takings from users (C$ 30 million).

Partnership through shared infrastructure has allowed theatres, laboratories and a sports centre to be set up, with the establishment of non-profit bodies : the *Agora de la Danse*, the *Corporation en Environnement*, the *Centre Pierre-Péladeau* and the sports centre (C$ 33 million).



View from the Outside



Indoor Square

THE "PLAN UNIVERSITÉ 2000" IN FRANCE

Catherine Chauffray, Architectural Division, ministère de l'éducation nationale, de l'enseignement supérieur et de la recherche, Paris

"Locations for new universities – which are totally indispensable – correspond to two complementary sets of logic. First, there is the "logic of densification", whose purpose is to introduce new teaching or research modalities on existing sites where the university network is already dense enough. Second, there is the "logic of extension" – when initial university sites are saturated – and when a significant part of the space is not properly used by the network"[10].

A number of examples illustrate these strategies : first, the example of Cergy-Pontoise, which constitutes a particular case of extension since it is a newly created university. Second, the example of Lyons – France's second university city – which, in reconstructing its university, chose to bring it back to the city centre. The city of Brest followed this same path and developed a technopole. Very recently, the Law School of Lille II settled on the site of old mills near the city's heart.

These urban relocations, often bringing universities into old civic or governmental buildings now being reused for these new purposes, are common to numerous cities and seem specific to France.

Densification on a typical "French campus"[11] can be illustrated by examining the case of Grenoble. The "*Plan Université* 2000" was always concerned about quality for both university areas and university architecture, so it was necessary to frame the new construction programmes in this light. The example of Grenoble will allow an examination of this concern for quality and its attendant problems.

Finally, a brief examination of other examples of today's university architecture, which show diversity in building conception as well as in site integration, are included.

The University of Cergy-Pontoise

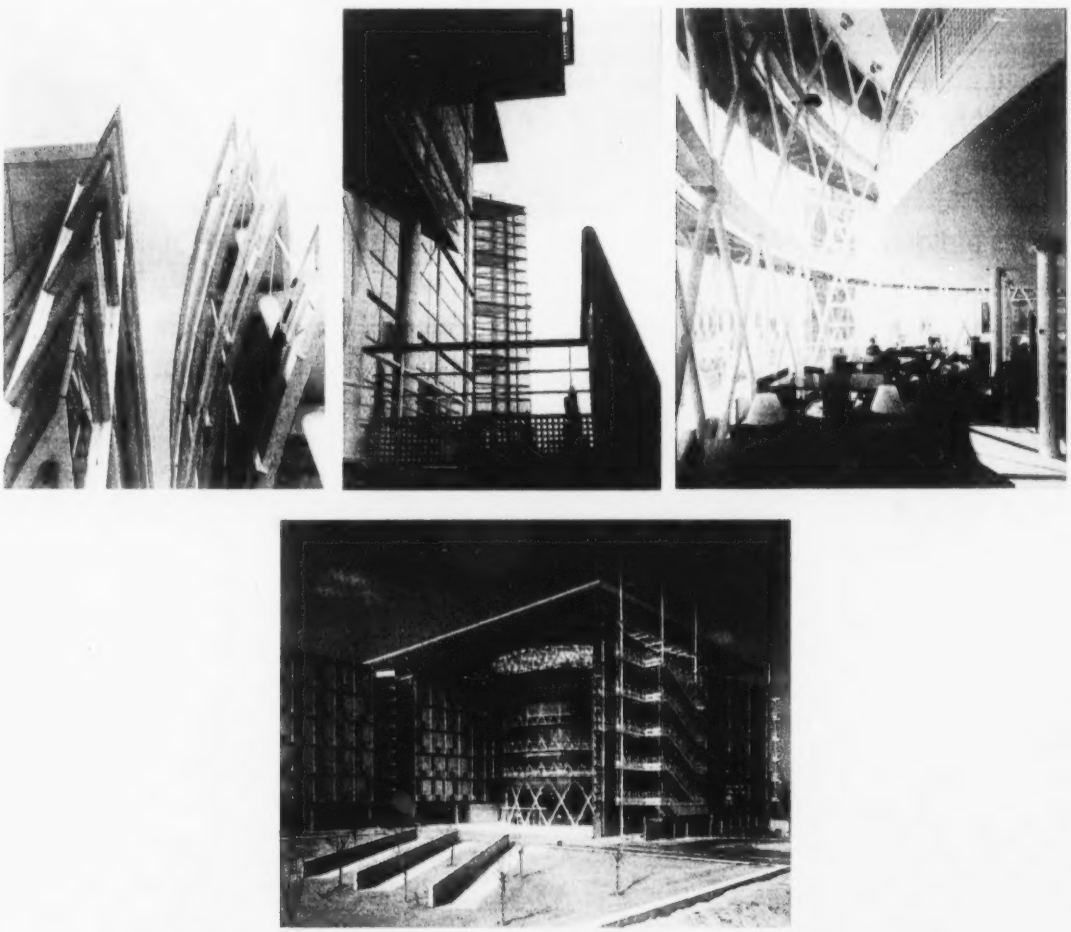
The University of Cergy-Pontoise is one of the four new universities implemented by the "*Plan Université* 2000" in the planned cities (*villes nouvelles*) of the Ile-de-France region. The four new universities of Ile-de-France : Cergy-Pontoise, Évry, Marne-la-Vallée, and Versailles Saint-Quentin, were created in July 1991. These new facilities integrate the branch or remote-site campuses that existed before. These have a special status.

This project actually preceded the start of the"*Plan Université* 2000". Indeed, the idea to build universities in these new planned cities in order to free up space in Paris's universities without depriving students of a developed urban framework was proposed by Paul Delouvrier – the father of French *villes nouvelles* – in the 60s;

the idea was taken up again by the chief education officer of Versailles as early as 1989.

Located 30 km. Northwest of Paris, the city of Cergy-Pontoise includes 11 districts and 180 000 inhabitants. Its surface area is more or less equal to that of Paris. Cergy-Pontoise was already a university town before it welcomed the new university. Indeed, 5 000 students were taught in approximately 15 schools of tertiary education.

The University of Cergy-Pontoise acts, in the replanning of the area, only as it should – as part of the plan to reduce overcrowding in Paris universities. It is actively supported by local communities which finance these facilities along with the state on a parity basis, which include, in particular, the Val d'Oise Department, but also the *Syndicat d'agglomération nouvelle de Cergy-Pontoise* and the Ile-de-France region itself.



The University of Cergy-Pontoise : the Saint-Martin Site (Guy Autran, Architect)

The main characteristics of the university are :

- the university's *urban location* makes it an important element in the scientific, cultural, economic and social life of the city;
- *growth is very rapid* : greater than 2000 students per year;
- *young teachers and researchers* : average age of associate professors (*maîtres de conférence*) : 32; average age of university professors : 41;
- *a multidisciplinary and diversified education* : sciences, law, literature, foreign languages, economics;
- a growing *partnership* with the area's private sector;
- the University of Cergy-Pontoise also features *a multisite location* conforming to the main ideas of the university development plan;
- the functioning of such a location is *dependent upon public railroad and urban transportation services* such as the RER and SNCF.

In addition to already existing facilities, new support facilities accompanying them support, in turn, the civic heart of the newly planned modern city.

Three principal locations are divided up as follows : the development of the Human Sciences sector is located on one site, *Les Chênes*, in Cergy and the *Les Chênes* building, close to the *Centre Préfecture*, which opened in 1993, is the leading part of the university.

The School of Law, Languages and Economics, conceived by the architect Michel Remon, was considered by builders and architects when it first opened as "the most accomplished university operation under the supervision of the "*Plan Université* 2000" of the past four years"[12].

The building is owned by the state with a construction duration from July 1991 to September 1993 on land put at disposal by the EPA of the *ville nouvelle*. The building surface equals 37 000 square meters with 467 lots of underground parking, and has a capacity of 5 000 persons. The total budget was 250 million francs. There were two major technical constraints : the RER passing under the Northern part of the building and the Le Havre-Gennevilliers oil pipeline passing under the Western part of the building.

The scientific and technical sector was developed on two sites : the site of *Saint-Martin* which is located in the town of Pontoise and the site of *Neuville* (11 000 square meters; owner : the state). The site of *Neuville* is located near an area zoned for private business; being located on the A line of the RER, it has the distinctive feature of having been preceded by the construction of a new RER station named *Neuville - Université*.

A study about new universities is currently featured in the "*Plan Université* 2000" evaluation framework. It seems that Cergy is a somewhat exceptional case : a particularly dynamic partnership has been established between the state and local communities, which is not the case of Marne-la-Vallée and Saint-Quentin.

That partnership first occurred on a financial level, according to the principle of the "*Plan Université* 2000", but then local communities went further. Notably, lands were gifted for the first building operations, premises were found to accommodate the burgeoning university, and financing more than initially planned was accepted in order to prevent construction delays.

Grenoble : the Implementation of a Refurbishment Plan of a Campus Dating from the 60s

When university building programmes started again at the end of the 80s, the question regarding existing campuses arose in the context of this new development : how to build thousands of square meters on campuses which were not properly conceived from the start, were sometimes enormous, and were in most cases still isolated from any kind of relationship with their surroundings – even when urbanisation had reached their area?

Grenoble's university domain is the first example of a new qualitative process involving the organisation of new facilities and the establishment of links between the university and the city. The university can be categorised as a large campus (176 hectares, 400 000 constructed square meters, 38 615 persons in 1990), and is the second largest in surface area after Bordeaux (260 hectares), both of these were developed on the periphery of their cities on lands acquired by the state according to the practices of the time.

In addition to the problems of the increasing number of students, a tramway line opened in December 1990 to serve the university and the University Hospital Centre, which then highlighted the absence of local management of university land and poor city planning regarding the university itself.

In March 1990, an international competition was organised for the first time in France in order to seek ideas for a reorganisation and refurbishment of the campus, and the winner was the British architect and town planner Peter Ahrends.

The necessity to establish a partnership appeared rapidly. In the interests of consistency, an association gathering heads of education, local communities, and state services was created : the ADUAG (Association for the University Development of the Town of Grenoble), financed 80 per cent through the Department, the local authorities, and the four universities.

From Competition to Realisation

Peter Ahrends's concept is based upon development of a woody and varied landscape site while increasing nearby urban development at the same time. The campus is reorganised along an East-West "backbone", a common attraction point gathering shops, kiosks, cafés, support services, and apartments. This high density urban strip becomes a unifying element around which is organised a network of main and secondary trunk roads. As far as traffic is concerned, the architect has chosen to make cars park at the main points of access and to create four car parks for approximately 6 000 lots.

The size of the project raises the issues of its economic, legal and logistical feasibility, as well as of its adherence to the university programme planning which had not been well defined beforehand. Consequently, all these issues had to be examined. The ADUAG organised workshops on themes such as : the campus layout, the programme planning, the financial setting-up, and so forth. Small changes were made to the Ahrends plan mainly concerning the lake, the shuttle serving the mall, and the car parks.

The project is faithful to the main idea of the competition, which was the hierarchical organisation of the campus areas[13].

The backbone (centre of communication and exchange serving the campus) was reconceived keeping in mind the "*Plan Université* 2000". Thus, it could be "densified" using significant university projects and strategies such as commercial offices. On the other hand, the perpendicular branch sites were abandoned on the short-term. The landscape was truly restructured and its value was enhanced. It now represents 50% of the university. This project was considered as a qualitative refurbishment of extra-urban spaces.

Five years went by between the international competition, the realisation of the current project, and the consulting process necessary to establish commercial business. These five years required a chief organiser, the setting up of financial deals especially those regarding public spaces, and showed the necessity to deal with the question of the state responsibility regarding the development of services and businesses.

Today, the ADUAG has weakened. Unlike it was in 1990, the university community is no longer united, and each of the four universities manages its campus area separately. Thus, carrying out the development programme has become difficult, and furthermore, other urban maintenance problems are emerging, such as highway repairs (which are 32 years old) and public lighting. It is on this theme – the management of public space – that it may be possible to mobilise the different actors again and revive the stagnating programme.

OTHER EXAMPLES OF UNIVERSITY ARCHITECTURE AND DIVERSIFICATION OF UNIVERSITY AREAS

The University of Versailles - Saint-Quentin

The Vauban College in Saint-Quentin-en-Yvelines, conceived by the architect Antoine Grumbach on the model of the Anglo-Saxon university college, constitutes the first element of the programme planned for that site, which includes a library and other colleges dedicated to Human Sciences. This college is the first of its kind in France. It groups together teaching and research functions and support services for university life : a dormitory with 118 rooms, a double cafeteria and a gymnasium.

This college's particularity is also due to the fact that housing is reserved for some students and their guardians. The architect was first asked to study the new school's development site. He was then the winner of a consultation study contract and designated as architect of the Vauban College and its library.

The urban planning choice was clear : to develop the new university between the city and the source of the Bièvre river. In order to guarantee a successful spatial relationship between the city, the college and the river, the area was delineated by a 60m. wide strip in the shape of a T. This public space surrounds the university and is extended between the two buildings that form the first college by means of an alley leading to the park. This area is managed and maintained by the city, and a car park including 225 spaces for university use was designated on it.

This project stemming from the "*Plan Université* 2000" has been long and difficult, in particular because of the mixed used aspects which necessitated three separate working projects. The net surface area is 20 000 square meters with a capacity of accommodation of 2 200 students.

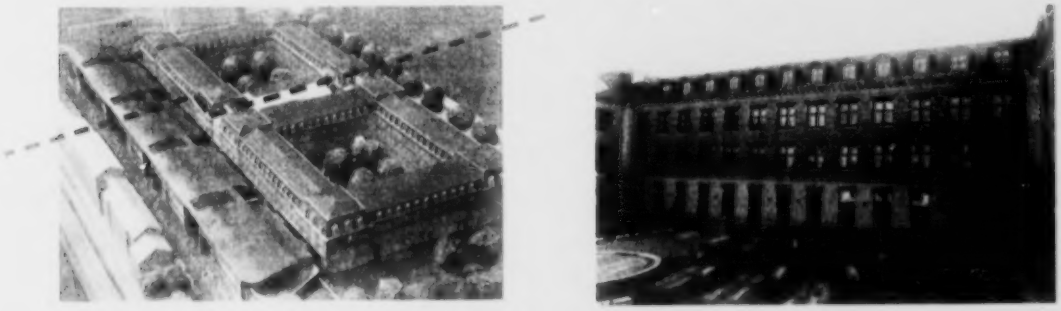
Lyons - the *Manufacture des Tabacs* - Example of an Urban Development Dynamic : the Return of the University to the City

Converted into a university centre, the *Manufacture des Tabacs* is located at the core of the city in Lyons' 8th district and accommodated 6 000 students as early as the beginning of the 1993 academic year, including law undergraduates and tertiary students coming from the university Jean Moulin/Lyon 3. During the first stage, approximately 16 000 square meters of existing premises were refurbished and 5 500 square meters were built, including lecture halls and large classrooms.

This site will accommodate 13 000 students in the long-term and is the result of redistribution between the three universities in Lyons as planned according to the "*Plan Université* 2000". Lyons is, on a national level, the second site after the

Paris region concerning the volume of its activities in tertiary education and research and its number of students (86 500 approximately). Thirty thousand more students are expected by the year 2000. The university, which had been banished to the city's edge, is now coming back to strength. The conversion of the *Manufacture des Tabacs* was the first aspect of that change– it is a strategic and significant site, as well as a landmark in the city of Lyons.

The fundamental change in this building's use resonates in three different ways on the urban and sociological plan. By relocating the university in the centre of the city, it becomes a unifier of urban operations in the development of the East-West corridor of Lyons, and it transforms the city with its university life. Cultural activities stimulate economic development and give dynamism to residential development. It finally gives a new image to the neighbourhood, which will tend to become a centre of residential life across a few years' time.



Lyons - The *Manufacture des Tabacs*

In 1991, 30 000 square meters were released by the *Societé d'Exploitation des Tabacs* (SEITA). The first part of the project delivered at the start of the university year in 1993 was two sites in one. It was necessary to transform the North buildings through the demolition of old structures and the construction of 5 500 square meters for lecture halls among other things. This phase of work was financed through a partnership between the state, the department and the city authority of Lyons, which provided the project management.

This political and partnership know-how made it possible to take advantage of such an exceptional opportunity and thus to break with the era of huge peripheral campuses dating from the 1960s.

The *Manufacture des Tabacs* was conceived by Joseph Clugnet (1854-1911), and was built over twenty years, ending in 1932. The site consists of two main buildings linked by galleries and surrounding two square courtyards. It is a rich site testifying to industrial techniques and politics of the 19th and 20th centuries.

It includes : 5 lecture halls with 450 seats; 4 lecture halls with 300 seats; 2 rooms with 200 seats; 7 classrooms with 100 seats; 54 classrooms with 36 seats; 660 square meters of sports buildings; an underground park with 150 lots. The financial arrangements included : 35 million francs for real estate acquisition; 145 million francs for planning and building; 13 million francs for the equipment.

AN INNOVATIVE HIGH DENSITY SOLUTION IN GREECE

Anastassios KOTSIOPOULOS, Professor of Architecture, Aristotle University of Thessaloniki, Greece

The AUT Campus[14]

The Aristotle University of Thessaloniki, Greece (AUT) is a densely populated urban university campus. Its expansion in the last thirty years reached a critical stage of development that became the subject of a planning and design research project.

The project aimed at investigating future expansion, at re-establishing coherence to the urban structure of the campus, and at planning a network of urban pedestrian and vehicular movement. The main question faced was how to maximise density in the campus without destroying its urban qualities.

The "reading" of the existing topography, the builtscape and the urban structure of the campus, focused the project on the use of :

- new buildings that will establish the façades of the university and will "repair" problematic areas in the perimeter of the campus;
- the creation of a new pedestrian axis in the middle of the campus by building on slopes and underground and by using the terraces of underground buildings as new pedestrian streets and squares.

Issues are presented by reference to six specific design projects :

a. new façade-buildings :

- the new building of the Faculty of Sciences (5 500 square meters);
- the new building of the School of Veterinary Science (3 500 square meters);
- the extension of the School of Dentistry.

b. new underground and on-slope buildings :

- the new building of the Main University Library (4 500 square meters);
- the new buildings and the extension of the Faculty of Technology (20 000 square meters);
- the new building of the Faculty of Humanities (3 000 square meters).

The AUT Campus and New Campuses in Greece

The architect and planner H. Hebrard was the first to propose a master plan for the AUT campus. This plan had a strong neoclassical character, organising urban space on a main axis of symmetry, and placing monumental buildings at focal points. The final master plan that was followed, however, anticipated that building expansion would be placed at the periphery of the campus, surrounding a large park placed in the centre. Even though later expansion increased quite significantly the density of the campus, its original plan was preserved at least in its basic urban attributes.

During the 70s the campus was expanded to facilitate a population of over 60 000. It covered a built surface of approximately 350 000 m^2 in a total area of around 45 hectares, and it became the largest and most densely populated university campus in Greece. Although the danger of high density was already evident, the AUT managed to retain its characteristic urban identity in its close link to the city, and to preserve its distinct nature of "buildings-around-the-park".

Plans for a future transfer of some of the AUT faculties to a new campus revealed the problem of destroying this link to the city. They also made clear that there should be a mid-term increase in density without destroying the urban qualities of the campus.

Awareness of such problems has led to diverse strategies in the planning of new campuses in Greece. For example, in the case of the University of Thessaly at Volos, the strategy adopted was to integrate the new university into the city. The problem there was how to create a university network by utilising and transforming existing buildings. In the case of other campuses, all at the outskirts of cities, the problem of creating an environmental character was approached in various ways.

In the case of the University of Patras and of the University of Ioannina, a continuous urban framework was proposed, accommodating the different departments into a grid structure. In the Technical University of Crete at Chania, the model of autonomous urban "islands" in the campus was chosen. In this case, the various faculties would create distinct microcosms, and retain a strong identity, while being integrated by a "loose" pattern of pedestrian and vehicular movement and of open space with sport and leisure activities.

On the other hand, in the University of Thrace, a system of strong axes, which organises the urban "islands" of the faculties, was preferred. In all cases, however, the question remains as to how to preserve the identity of the campus, while at the same time accommodating future needs.

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The General Strategy for the AUT Campus

When dealing with an increase of density, there exist certain possibilities : either vertical expansion, by increasing height, or horizontal expansion within the existing structure. In the fifty years of existence of the AUT campus, both vertical and horizontal expansion took place, and led gradually to an increase of building density at the expense of urban identity. Present and future needs were not anticipated within the original master plan. Thus, expansion followed a fragmented and arbitrary logic, a route which had to be overturned.

Horizontal and vertical expansion both deal with the increase of density on the surface. Another direction is offered by the possibility for a new layer -- underground expansion -- through the utilisation of slopes and of the underground space. In all cases the new buildings can be used in a "reparatory" way. They can produce "reparatory façades" to complete arbitrarily placed buildings or ill-defined open spaces. Such a new layer should also represents a new continuous (and not fragmented) microcosm. Possible restrictions have to do not only with the existing structure, but with its very nature as an underground space.

Thus the question faced by the project as a whole formulated a typological approach. This approach was based on the recognition of the urban structure of the campus, of its topography and its builtscape. Following it, a reversal in planning procedures was revealed. Instead of a linear planning procedure which follows a normal path from the schedule of accommodation to the final building, a quasi-typological planning process was applied starting from idiosyncratic building types defined by barriers and limitations.

The possibility for reparatory façade-buildings and of a new underground layer can only be seen as dependent on what already exists, either buildings or nature. Each new "fragment" exists in relation and reference to the existing building system, and establishes a dialogue with it. Especially in the case of underground buildings, the surface system provides the basic means of signification, while fragments of the new entity (skylights, ramps, partial façades, gaps, limits), penetrate the surface and signify the existence of what exists underground.

Projects

a. new façade-buildings

The new building of the Faculty of Sciences (5 500 square meters) is a linear and thin five-storey steel structure built on the exterior side of three symmetrical amphitheatres of the old (1950s) building of the School of Sciences (one of the buildings of the first phase of the campus design by P. Karantinos, one of the best

Greek architects of the period 1930-70). The old building is a large symmetrical structure designed to be oriented only to the main square of the university. The dramatic change of the surrounding urban scene necessitated a reconsideration of the urban role of that building by creating a new façade and entrance on its back side. The new building transforms the exterior walls of the amphitheatres into components of an interior space lighted up from the top, re-organises a previously "blind" part of the campus façade to the city and, in order to create a feeling of continuity, extends its morphology to the nearby tower.

The Faculty of Sciences

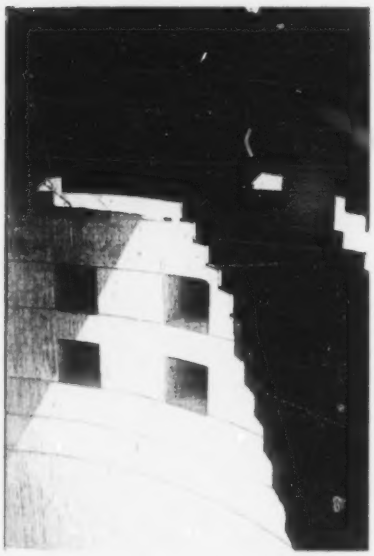
The extension of the School of Veterinary Science (3 500 square meters) concerns a new wing of the school complex. The extension is a building with an external curved brick wall which creates a new courtyard and creates a strong contrast against the white surfaces of the existing building.

The extension of the School of Dentistry (2 500 square meters) is an addition to the blind façade of a typical rectangular block of the 1960s. The addition creates a new façade to the West, that is seen by most of the drivers and pedestrians on the main street surrounding the campus. The new façade consists also of an external curved brick wall which functions as a boundary and includes a six-storey building of offices and laboratories.

b. New Underground and On-slope Buildings

The new building of the main university library (4 500 square meters) utilised the underground space in front of the main entry of the existing library building. Leaving the landscape intact, the new building follows the existing structural grid, and is extended in three underground levels. It accommodates a book storage floor, in extension to the basement of the existing building, as well as a double-

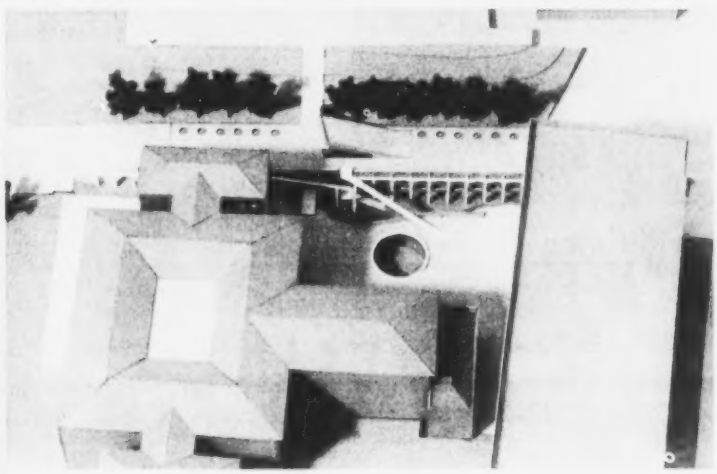
height reading room, framed by a grid of identical cells of open access book space in two levels. A large open-air atrium, cut by a bridge, leads to the level of the reading room, where the main entry takes place. A path in excavation creates a distance between the new library building and the old one, and re-establishes the missing part of the pedestrian axis, which crosses the campus and connects it to the city. A system of skylights allows natural light to enter the library. The main triangular skylight, supported by a system which allows it to move, penetrates the ground surface, and indicates what exists underground.



The Site of the Library

The new buildings and the extension of the Faculty of Technology (20 000 square meters) builds the slope at the back of the existing buildings. In its linear extension, it articulates the axis of the library and frames the existing buildings. The linear part, in three levels, accommodates offices, laboratories and classrooms, with an open corridor. The remaining part, expanding in two levels underground, utilises space for amphitheatres and large laboratories with skylights to allow for natural light.

The new building of the Faculty of Humanities (3 000 square meters) follows a similar typology to the previous one. It has also a linear part housing offices, classrooms and laboratories, as well as an underground, two-level part with amphitheatres. By building the slope, it creates boundaries and façades and thus it frames the urban space surrounding the old Humanities building.



The Faculty of Humanities

In conclusion, concerning the underground buildings, the following things happen : the neoclassical elements of the old building become interpreted through the monumental colonnade of the new building of the Faculty of Humanities. The curved brick wall of the library's new building and its solid geometry contradicts the linearity of the modern façade of the existing library.

The emphasised horizontality of the "crooked" line and the linearity of the extension of the Faculty of Technology juxtaposes the block-like nature of the existing buildings. A dialogue is created, based on interpretation and reference, as in the case of the Faculty of Humanities extension, on contradiction to geometry and materials as in the library, or on juxtaposition between the solid and the linear, the horizontal and the vertical as in the Faculty of Technology extension.

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In building underground, the concave aspect of space becomes primary, and as such, it brings certain reversals in design manipulations. Mass is hidden, and it is by means of a large interior void that scale and size can be read. Geometric definitions of the concave and its interior elevations compensate for the lack of a view of the building from afar.

The representational character of the convex reality of architecture cannot be escaped, however. Entries, passages, partial elevations and skylights become fragments representing what exists underground. As such, reversals in design manipulations, searching for a new concave regularity, cannot but submit to the ever-insisting deep structures of spatial organisation.

THE STRATEGY AND MASTER PLANNING PROCESS

Emerging Trends

A key question raised by the PEB before the conference was : what is the use of a master plan and how can it be best developed? The questions discussed at the conference showed that the issue for practitioners was not whether a master plan was desirable in principle but how it should be structured in the present circumstances. Who are the actors? What are the issues to be included? What is the scope for interaction between those who have a stake in the outcome? How can the planning process be made sustainable and adaptable?

Earlier in this report there are some examples of the interface between institution and the commissioning agency and/or government policy. These were illustrated by the master plans of the University of Montreal in Quebec and the Aristotle University of Thessaloniki. In this section appear notes from Kenn Fisher about the issues a campus master plan needs to cover, the complex processes involved in designing and managing a campus and how many professions are needed in the collaboration. He stresses that planning is also a communication exercise. In a difficult context when resources are diminishing proportionately and an institution is under constant pressure to change if not expand facilities, it is important not only for those involved to master the issues but to keep the public in touch. He emphasises the need to identify ways in which the process of development can be made interactive so that there is a form of dialogue between local concerns and broader strategic issues, "finding the self-sustaining planning process which is inclusive of users of the precinct." He also underlines what might seem an obvious requirement : the need to review past planning strategies and to conduct post-occupancy evaluations.

For many of those at Rethymnon the reality of master and strategic campus planning is that all too often the decision process fails to include key actors and key issues. A recurrent theme was that master planning failed to include any input

from the building's designers at the beginning of the project, never mind the public. For Ames, talking as a facilities manager, academics still tend to dominate the show. "We (the facilities managers) are a support group but to be effective we need to be in on the stage when the educationists are expressing concerns and proposing solutions". Robert Maguire, a professional architect, gave telling examples of the high price that can be paid for not questioning previous assumptions. As he put it : "We need to return again and again to root questions about people in higher education and the very idea of a university."

If the context is one of tertiary education, rather than of university education, some of the questions will be new ones. In the USA, 48 per cent of the age group now move into post-secondary education at the level of the first cycle community colleges. These include 47 per cent of students drawn from ethnic minorities. Their average age is 28 years. The Minnesota team of George Copa and William Ammentorp had been working in a graduate medical school with falling numbers, but switched to designing a new model for first-cycle higher education since that is where demand is coming from. They are convinced that the planning process has to get input from the widest possible range of those associated with the project. "Administrators and other support staff need to be included alongside teachers, community and business representatives in the team developing the 'new design'." The challenge from their perspective is to create organisational structures which are "flexible and meaningful in facilitating learning and a 'seamless' learning system."

NEW APPROACHES TO CAMPUS "MASTER PLANNING"

Robert MAGUIRE, Architect, Maguire and Co., Thames, United Kingdom

The master plan of a university or higher educational institution is a remarkable image of the institution's social, academic and even political ethos. None of the new universities started in the UK in the 50s and 60s has kept to its master plan, and the reason is always the same : the university itself has changed, not only in its academic structures and provision but, more fundamentally, it is now a different kind of institution. Consequently, its master plan no longer expresses its character.

For this reason it has been suggested that master plans be abandoned. This emotional response may bring sympathy, but unfortunately there remain many strategic issues involving such eventually practical matters as roads and sewage disposal, and capital allocations over a projected development plan, and it is not unreasonable for society to expect some lines and figures on pieces of paper.

Master plans sometimes involve the redesigning of plans, which has often proved impracticable or inappropriate. This highlights what is wrong with "master
66 planning" as it is commonly understood. To put it as briefly as possible, it is that it is

based on the town planning concepts of the 30s, 40s, and 50s with visions of what was good for people – the parkland campus (as the equivalent of the Garden City or the *Ville Radieuse*) and the university central axis (the new town centre) and so on.

Also, its visions of what was good for the motor car and the delivery truck. Master planning is also centred on a certain procedure in dispensing these visions, a procedure in which fixed assumed concepts about units – the Library, the Senate House, the Colleges of this-and-that, the Restaurant or Refectory, the Student Village, and so on – are disposed in assumed formal relationships highly constrained by assumptions about the extent of growth but also (most deceptively) about the nature of growth. This "old-style" town planning ceased to ask any fundamental questions about the lives of people, and relied on unquestioned assumptions all the way to the end-result.

So what should it be replaced with? A new method for strategic planning, one that returns again and again to root questions about people in tertiary education and the very idea of a university is suggested, indeed, necessary.

The first question to be asked, and answered, for a constructive approach is : "What is a university for?" This may be thought too fundamental and perhaps naïve, but in so much of present discussion there does seem to be an implication (or assumption) that the main function of a university is to impart knowledge, i.e., that it is an extension of secondary education.

However, it is not sufficient to see it merely as an instrument for gearing-up the youth of a country to be more knowledgeable and useful citizens and therefore a means of national economic betterment. While undoubtedly this is one major aspect of a university's purpose, above all, a university is a place where intellectual creativity is stimulated, developed, and promoted on a broad base through human interaction.

Seen in this light, a university becomes the agency of personal and national betterment at a multitude of different levels. It could be objected here that, although this may be so at professorial, faculty and research student levels, it does not really apply at undergraduate level, and that for many countries the undergraduate programme is the most urgent. This, however, would be to misunderstand the nature of undergraduate learning, which is as much, if not more, the development of modes of intellectual creativity and academic discipline as it is an extension of secondary education.

Emphasis in the definition above is on human interaction. In practical terms, this affects the whole physical manifestation of the university from master plan to building detail. It affects the relationship of buildings to each other, how they relate to outside spaces, walking distances, where people go for lunch, what they do about coffee breaks, how many floors buildings have, where motor vehicles are permitted to be, where and how people live and, in particular, the residential grouping of undergraduates.

Design submitted (finalist) for the master-plan competition for the University of Cyprus by Maguire & Co. Architects. A radical approach, with the emphasis on human interaction, resulted in a concept of the university as a small town, limited in total width to a ten-minute walk, with no motor traffic. Streets are as narrow as 4m for shade, and buildings no higher than three storeys. Catering is dispersed into small cafés and bars. The design is underpinned by thoroughly worked-out technical solutions to servicing and environmental problems and expansion within the given envelope.

MASTER PLANNING AND THE CRITICAL ROLE OF URBAN DESIGN

Kenn FISHER, Partner, Educational Planning and Design, Woods Bagot Architects, Australia

Some key questions were addressed at the conference in Crete. All of these questions have an impact on planning tertiary facilities but two have a critical impact on the campus master plan :

- Who has a say in the design and planning of new facilities and what norms or standards exist to regulate them?
- What is the value of a campus master plan and how can one best be developed?

One key missing element in the normative two- and three- dimensional master planning documents and approaches is the fourth dimension, that of time.

Over time these plans become out-dated due to inevitable and inexorable changes in the circumstances of the institutions, from both within and without. As a consequence, physical master plans in a rigidly documented "blue print", or even schematic form, can become rapidly out of date. A "new paradigm" is therefore inevitably necessary.

To understand the master planning process it may be useful to look to history. It is clear that a number of patterns have become evident in the evolution of tertiary educational campuses and buildings, particularly in terms of (i) architectural design; (ii) estate management and (iii) the campus planning process.

These aspects are clearly reflected in the campus planning process for Monash University's new Berwick campus in the high growth area of Melbourne, Australia. This campus is the result of a state response to the need for expansion in tertiary education demand, regional development and linkages with other educational sectors, particularly vocational training. The new campus required new approaches to master planning strategies.

Architectural Design

The designed physical image of universities has evolved since the 12th century through a number of phases dating from :

- the monastic, represented by Gothic and neo-Gothic architecture as epitomised in Cambridge and Oxford Universities in the UK (otherwise known in Australia as the sandstone universities), indicating the elite traditions and the fundamental source of power of learning and knowledge; to
- institutional, represented by classic and neo-classic design, as seen at Harvard or Stanford in the USA, indicating increased control by the state in setting educational (and macro-economic/business) objectives; then
- community, represented by modernist or international style architectural forms such as seen in the newer Paris group of universities, suggesting a dispersal of campuses for increased community access and equity, a major theme of the modernist movement; to
- a commercial model, more commonly represented by post-modernist buildings as seen in some of the newer graduate schools of management world-wide, indicating the influx of private sector funding and the commercial value of learning and knowledge; and, finally,
- an emerging contemporary approach which merges image with the "virtual" or distance and is represented by the new information technology and communications buildings, complete with satellite dishes proudly displayed, being designed as marketing symbols to demonstrate the high

technology orientation of their owners, suggestive of the new autonomy of universities and the increased commercial competition for students, research and, perhaps most importantly for any business enterprise, the attraction of high quality staff.

Many universities combine these approaches, particularly those which are older than, say, 30 years. Monash has opted to focus on the contemporary approach outlined above, whilst still retaining some of the characteristics of the other phases through its developmental stages.

Estate Management

Similarly, there is an evolutionary pattern evident in the management of these increasingly complex, often dispersed and diverse estates, represented by specific campus facility management styles, including :

- estates management up to the 1960s, along traditional lines; a focus on campus planning in the 1960s and 70s responding to the major growth phases, with little interest in whole-of-life costs or facility management;
- project management and physical plant management in the 1980s and 90s in response to increasing complexity, life-cycle-costs and the need for more effective utilisation of resources; and, finally
- facility management, in response to more corporate approaches to emerging trends in multi-disciplinary asset management with the assistance of information technology and communications management systems.

In this context, Monash focuses on technology as a key element in the development of its new campus at Berwick.

The Campus Planning Process

A third pattern can be found in the process of educational campus planning and architecture and this, generally speaking, has evolved through these steps :

- architects taking a traditional leading multi-disciplinary role up to the 1960s;
- town planners emerging as campus planners to shape the growth of campuses, both in themselves and as they relate to town-scapes, in the 1970s;
- landscape architects filling in the spatial gaps between the often dispersed buildings of the time located generally in green fields in the suburbs (for access and equity, as noted above) in the 80s ; and, finally

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- the recent emergence of the urban design profession as the "glue" to bind together the previous three (and others, such as transport and engineering services) disciplines in the 90s, in order to create liveable spaces.

At Berwick, the need for a careful urban design analysis and process was critical in order to make the best use of a difficult site. The new campus was a former airfield adjacent to a major auto-freeway across another major road from a key vocational training institute. It is associated with an active and isolated community vitally interested in engaging with the new resource as a community asset.

Urban designers, who represent a truly multi-disciplinary integrative profession, have been struggling for some 20 or more years to have their voices heard. This may, in part, be due to the fact that it is extremely difficult to find urban designers who have the experience, consultative and multi-disciplinary skills to design a complex tertiary campus. There is no question, though, that they will be ultimately heard. As tertiary education and vocational training rushes headlong into the virtual and global village, people will increasingly strive to seek "built form" ways to confirm their identity and to establish meaning in their personal and working lives :

"As long as humans have dwelled on earth, we have found ways to make our places meaningful. The making of places - our homes, our neighbourhoods, our places of work and play - not only changes and maintains the physical world of living; it also is a way we make our communities and connect with other people. In other words, "place making" is not just about the relationship of people to their places; it also creates relationships among people in places."[15]

As such, "placemaking" is inherently involved with the passing of time. As time passes, inevitable changes will see universities, vocational education and facilities for lifelong learning re-focusing on designing places for re-skilling in a team or group environment, where campuses will be designed to attract students to study, and industries to cluster, collaborate and collocate and contribute to a variety of learning modalities. These places will provide three key spatial characteristics :

- reflective learning spaces, evocative of the monastic and "introspective" tradition;
- active shared learning spaces, where academics and students will share resources with the community at large and with commercial and private sector providers. They will work in shared "action learning" group (or "extrovert") experiences and activities;
- commercial spaces, where commerce and industry will be clustered around the educational institution to create a critical mass of activity, each building upon the other's business activity in the pursuit of research, learning and

vocational training as a saleable or tradable commodity with two-way economic benefit to both the region and the institution.

These approaches are all evident in the Berwick campus, as can be seen in the photographs and sketches. The increasingly complex and competitive world of higher education will undoubtedly see the emergence of physical campuses and educational architecture which will be more human in its appearance, and more likely to attract people to interact and exchange ideas. Such campuses will foster multi-disciplinary team research and learning including (perhaps not so) new ways of developing new, and just-in-time, knowledge.

This design transformation will be both complex and consultative due to the interdependence of the campus "citizens", both public and private. Urban designers who specialise in educational, "commerce park", retail and (electronic) entertainment will take the baton in this new wave of activity in order to address the key questions of the Crete seminar - who has a say in the design and planning of new facilities and what norms or standards exist to regulate them and, what is the value of a campus master plan and how can one best be developed?

It remains to be seen whether urban designers are able to critically appraise and analyse the power structures, whether they can assist those at the margins in having a voice, and whether they will keep the longer term interests of the broader lifelong learning community to the forefront.

The Australian National University
View of Existing Union Court

The Australian National University
Urban Design Proposal for Union Court

NEW DESIGNS FOR LEARNING

George COPA, Professor of Education and Director of NCRVE, University of Minnesota, Minneapolis, USA

The design of technical and community colleges (two-year institutions of higher education) for the immediate post-secondary years was the subject of a research project by the National Centre for Research in Vocational Education (NCRVE). A follow-up to the "New Designs for the Comprehensive High School" project, the study has been in progress at the University of Minnesota site of the NCRVE.

Purpose and Focus

The overall purpose of "New Designs for the Two-Year Institution of Higher Education" (NDTYI) was to identify, analyse, and synthesise information from several sources in order to develop new designs for the two-year institution. Two-year institutions of higher education include community colleges, vocational and technical colleges and institutes, and two-year professional schools. The focus of NDTYI was the technical, occupational and professional components of two-year institutions, as well as the liberal, general and academic components of post-secondary education. The New Designs deal with such important issues as the following :

- learner outcomes leading to a better educated and able workforce;
- learning processes that can arouse motivation, respond to diverse learning styles, and result in higher-order thinking skills;
- organisational structures that are flexible and meaningful in facilitating learning and a seamless learning system;
- approaches that encourage partnerships and collaboration between schools, business and industry, and the community;
- a staffing pattern that acclaims new theories and practices of leadership and teaching;
- cost and sources of funding that are consistent with emerging trends in higher education finance.

Design Phases

The design process used in this project follows the pattern used in "New Designs for the Comprehensive High School". The basic idea is to develop the design through a series of phases involving group process (design group, focus groups), scanning the nation and the world for best practices, and research analysis and synthesis. The phases are as follows :

- describing the learning signature for the two-year institution;
- describing desired learning outcomes;
- describing desired learning processes (i.e., curriculum, instruction, assessment);
- describing desired organisation and partnerships;
- describing staffing and staff development;
- describing desired facilities, equipment and supplies;
- describing cost of new designs;
- developing strategies to announce and disseminate NDTYI.

Phases one through three were undertaken during 1995. Phases four through eight were carried out during 1996.

Design Process

The project sought to redefine what a 21st century, two-year higher education institution should look like in all respects (educational philosophy, organisational structure, teaching-learning processes, staffing patterns, financial and funding possibilities, physical layout, and so on). In doing so, the project was grounded in the work carried out by the National Centre for Research in Vocational Education, other research, restructuring projects, proposals and ideas from around the US, and experience in other countries. The New Designs provide a synthesis to guide longer-range planning and policy.

Project Guidance

Focus groups were used to raise and to clarify issues and potential solutions during each phase. A design group, including national representation of important stakeholders, was selected to guide the project to consensus on issue resolution at each phase.

Special attention in the design process was given to related efforts such as the work of the League for Innovation and regional accrediting agency initiatives designed to enhance institutional effectiveness. Design-group meetings were preceded and followed by extensive staff work to ensure that the most relevant findings of research and practice were taken into account in the project.

Close Collaboration

Developing the New Designs in close collaboration with the following individuals and organisations helped insure that the prototypes were strategic, and yet also workable in practice : imaginative practising teachers, administrators, and other support staff; state education agency personnel; professional organisations

(e.g. American Association of Community Colleges, American Vocational Association); policy-makers, community representatives, parents; students; and business people.

Outcomes

The products of this design effort included an executive summary and final report describing the educational specifications and supporting rationale for new designs for the two-year institution of higher education.

FACILITY DESIGN FOR INFORMATION TECHNOLOGY AND COMMUNICATIONS

Emerging Trends

Information technology is part of the context and part of the response in contemporary tertiary education. As such it arouses both uncertainty and passion. Shattock is not the sole senior university administrator to dare to say that, as he does in his paper, "the cyber-culture remains ... a distant and unlikely vision for educating students in higher education." But there will be plenty of others with more positive responses having seen the impact of administration and teaching, and the possibilities IT opens up for research. Taking an example given in this report from the UQAM in Montreal, there is an expectation that facilities will include "virtual" libraries and "virtual" laboratories.

For planners and administrators at government and institutional level it has become urgent to draw on their peers' experience of the possibilities and pitfalls of IT in the contexts of institutional management, teaching and research. How should they be planning for IT and in what forms? It is not simply a matter of speculating that changes in computer design and an unpredicted exponential growth, in the use of e-mail, can shatter space requirements, planning and maintenance budgets. They need to know about the impact of IT installation on the way an institution functions in terms of costs and attitudes.

To take a facilities manager's concern at Rethymnon : what is the experience of theft of computers and how have institutions been countering it? In Australia it is a major problem. At Strathclyde in Scotland for the moment it is not, due to smart cards. Iceland's experience thus far has been that university property has been respected.

There is also a hunger for information on the way the application of new technologies creates entirely new "markets" and "customers" for learning. This is already evident in continuing education and training. The "half-life of knowledge" has become a major issue for the economy.

But will IT dominated structures become a cost-effective pattern for traditional higher education institutions too, and if so at what levels? Planners and administrators want some objective judgements brought to bear on the missionary-like statements of the enthusiastic exponents of the contribution of IT to the learning process, who have seen its contribution in specific situations. Examples include the multi-media distance learning structures developed in Australia and the success that IT dominated methods have had elsewhere with disaffected learners who have appreciated the opportunities for self-paced learning.

There have been many false dawns in the past as educationists have over-estimated the educational benefits of technological innovation and under-estimated the practical impediments to its use, as Renwick notes in the article quoted earlier. We must expect that the scene is being set for a vast increase in institutional networking with much more scope for entrepreneurial activity in post-secondary education and a blurring of earlier distinctions between public and private sectors approaches.

Lindsay Ames, the Capital Works Manager of TAFE, New South Wales, makes the point that IT has been a part of the lives of today's students since the day they played their first computer game, let alone got hold of a bank card or stopped by at a cyber-café. "The demand will be for access...at all times of day and night" he warns.

FACILITIES AND SPATIAL PLANNING FOR NEW INFORMATION TECHNOLOGIES IN AUSTRALIA

Lindsay AMES, Head, Capital Works and Research, TAFE, New South Wales, Australia

Understanding New Consumer Expectations

Common expectations today are marked by the consumer's demand to have readily available information and services that twenty – or even ten – years ago would not have been possible. Today's consumer does not give a second thought to the myriad of transactions involved in their daily life or come to absorb the amazing world of technology.

For example, the ever-increasing use of the motor vehicle demands that traffic control on our major roads be precise, faultlessly repetitive and commonplace. This requirement is reflected in the consumer's demand for the motor vehicle to be extraordinary reliable, responsive and contain an abundance of features. Such features as electronic ignition, fuel injection and engine monitoring, are now expected on the average car, where once only the higher priced motor vehicle boasted such features.

The consumer of the nineties has come to expect automatic banking and financial information, direct dial international telephone links, facsimile machines, mobile telephones and microwave cooking every day without the thought of how technology has brought us closer to the next century. Although the marvels of technology have changed our most basic way of life, in the 21st century we will demand even more.

At the centre of the technological revolution is, of course, the computer, a device which can be traced back to the 1800s. The breakthrough for computers was clearly the invention of the transistor in the 1940s and the development of the silicon chip in the late 1950s. The personal computer began to appear as late as the 1970s, a mere 25 years ago.

These were evolutionary changes and today, in Australia, home computer ownership has risen to almost the same level as that of business. We use our personal computers for much the same things that we always have, with limited, if any, access to the outside world.

The most significant changes have not come from the personal computer on the desktop but the connection of computers at every stage of business. The world of business has embraced the technological advances offered by the computer. It would not be possible for today's business to function without the world of computing. This is reflected in the extensive use of word-processing, spreadsheet and database packages which form the core of modern business.

For business to survive in today's competitive environment, information such as expenditure, cashflow, stock control and usage rate, client information, competition data and personnel data must be immediately available, and – much like the traffic control systems on our roads – precise, faultlessly repetitive and commonplace.

The information superhighway will become an integral part of all business and lifestyles in such a way that "...computing is not about computers any more. It is about living...".

The significance of such deliberation is that the consumer and business person of tomorrow is the student of today. They will expect facilities and systems to be in place both in the learning environment and in the workplace. The student entering tertiary education in the 21st century will have a solid foundation in systems which, less than ten years ago, were the sacred property of engineers, accountants and scientists. The personal computer has brought about such a change in the prior learning profile of the future student such that education providers must critically analyse facilities provision along with the shift in fundamental learning principles.

Most significantly, one of the major problems facing facilities planners is the increase in information technology that is permeating the education sectors, both

in vocational and in higher education. With this comes the challenge to provide facilities that are both flexible to allow for changing needs in curriculum and also to provide for the specific needs of educational delivery methods currently impacting on the education scene.

Flexible delivery is taking its place alongside traditional methods of delivery such as the face-to-face student/teacher configuration. We are now beginning to see more signs of self-paced learning, computer-aided learning, distance learning, tele-learning – all of which demand a higher degree of provision in communication technology. No longer do courses associated with the sciences, engineering and accounting dominate the stage in the demand for information technology nor the flow-on to computer technology in the form of hardware and software.

The more traditional courses such as the trades and basic-learning skills are undergoing major changes with curriculum inasmuch as these are being developed with a heavy emphasis on computing literacy.

With a continuing shortage of capital funding to provide both for new buildings and hardware and software equipment, there is need to develop strategies which will address the asset management of educational facilities. These strategies must address sustainable development, re-use of facilities and the joint use of facilities by education sectors taking into account various sector requirements of technology and facilities specifics.

There will, without a doubt, be a continuing need for educational institutions such as vocational institutions and universities. It is the role of these institutions to develop the generically needed communication, analytical problem solving, teamworking and management skills.

The major difficulty, however, is not the ability to reuse existing facilities – although economic justification is very difficult given building codes and standards that many older buildings were built under – but more the rapidly changing scene in education delivery and the lead time, sometimes equating to years, to deliver a facility.

This is further complicated when briefing documents are prepared primarily to meet current requirements but ignore flexibility and future needs. Considerable demands are placed on educationalists to come to terms with current technologies in curriculum delivery, and then to express facility requirements to the planners. Planners will need to understand technologies and develop a schedule of accommodation which takes account of the paradigm shift in education and learning.

Arguably the most significant factor which facilities planners must be aware of is the impact of the Internet on education. Although access to the Internet is still relatively limited, system providers of satellite, cable and telephone are opening the world of the Internet and the World Wide Web to all who seek it.

No longer can traditional, face-to-face teaching be conceptualised by a facilities planner given that major facilities which are designed today are unlikely to be built and completed for a minimum of two years. If, as a consequence of the information revolution impacting on business and private life, we are to have facilities which will fulfil the infrastructure needs of educationalists, then planners need to develop an almost futuristic view of life.

The Student of Tomorrow

The "sci-fi dreamers" of the sixties will see many of their conceptions realised as we leave the 20th century. Indeed, it is essential that facilities planners also dare to be more imaginative in their concepts of floor plans and the integration of technology. There is a need to design facilities as overall environments of work, play and education. No longer can these areas be viewed as discrete with clear and precisely delineated lines. The young secondary student has already integrated play and education and comes to higher education with a strong understanding of the information world.

The student of tomorrow will venture into an area previously unknown to parents, employers and many current educators. This land, not found on any map, is now becoming commonly known as "cyberspace", where the intrepid venturer discovers the world of the computer.

Physical realities are perceived but are not real to the touch. Virtual reality enters to allow the traveller to experience "life without life". What would, in real life, be a life-threatening encounter becomes an adventure where mind games are played and skills tested and expressed all without the creation of a physical facility or without leaving home.

The student of tomorrow will dictate the facilities that will be required and will outstrip any new or innovative system we can imagine. The individualisation of courses and curriculum will be questioned given that traditional systems of education practice may become outdated.

The need to attend classrooms for education is already questionable given the established nature of open learning, distance learning and, indeed, a most respected form of learning, research.

Research, as one of the foundation stones of the university system, provides us with a clue to the future of education spaces. Here a student is expected to search for information whether through text or experiment. The face-to-face lecture style of learning has little place in the world of research, yet from it comes the revolutionary technological and scientific discoveries.

The classroom of the future is a space which must be seen as part of a system, a system of education, a system of social structure and a system of networks. A system so large that the space in which we learn may become so

small that it may be in the form of a hand-held information device. Today the laptop is considered the norm in business and, indeed, is becoming commonplace in some schools in Australia.

In reality, education involves knowledge we require to operate in the world, whether in business or play. If we can fulfil the requirements of both with "just-in-time" education, then it could be argued that there is little need for the traditional form of comprehensive education, which, in part, provides us with knowledge which we may never use or at best adapt to meet the specific needs of our lives.

The classroom of the future may become a "virtual classroom" occupying only a position in cyberspace with conversion and maintenance costs being a function of systems engineering at the control keyboard of the engineer.

Technology and Teaching

What should facilities planners be concerned with that will allow the futuristic world of the educators to be considered? The reality is that although major developments are being made with technologies constantly, there is, and always will be, the need for the students to interrelate with each other.

We cannot cope with learning in isolation. The traditional attendance at "school", however, must be compared with the on-line chat sessions already on the Internet, spanning the globe.

It is clear that the current building stock worth billions of dollars will not become inappropriate overnight; there is little need to drastically alter the way in which facilities are planned. However, there is an urgent need in developing strategies for facilities provision, for planners to more conscientiously consider the mode of teaching. It is only when one enters the world of technology that an understanding of terminology is essential before realistic discussion and understanding of required infrastructure is furthered.

The demand on facilities planners to accommodate current and future needs lies in both an understanding of the furniture and equipment which must be provided in learning spaces but, further to this, a broader understanding of the impact of the technology revolution. With the advent of networks and in particular technologies that are designed for remote learning such as tele-learning, on-line conferencing, cable, satellite and access to the Internet, the classroom might be seen as any space at all. Planners must consider how to accommodate the infrastructure necessary.

Conclusion

Learning is a multi-dimensional and multi-level concept. Viewing learning from different perspectives is derived from different beliefs about learning. There are limitless ideas about what to learn and how to learn. Everyone has learning experiences, and everyone has ideas about learning.

Through attaining an understanding of the technologies, it is easier for both the educator and the planner to more appropriately articulate the requirements for infrastructure. Where once the "technocrats" drove changes, the information revolution is being forwarded by the advances in technology and access – but is clearly in the hands of academics and students.

Facility planners will require more than an understanding of the flexibility of buildings for re-adaptation and reuse. There will be, through the availability of distance learning technologies, an increased demand for access to resources, whether they be in libraries or in on-line classrooms, with an ability for students and academic staff to communicate at all times of the day and night to discuss, review, research, report and deliver.

It is with this approach in mind that facilities provision will more appropriately meet the needs of both today and into the 21st century.

MANAGING SPACE AND OTHER RESOURCES

Emerging Trends

Many organisations work with space norms but do not necessarily make public their utilisation figures. Prisons work on cell occupancy of 100 per cent or more; hospitals work on bed occupancy, usually over 90 per cent; hotels budget on an average bed occupancy of 70 per cent. University classroom and specialist accommodation can be as low as 30 per cent and 20 per cent respectively.

This, however, may be changing. In some countries with strong central direction there are space norms promulgated from the centre (e.g. Norway). In the UK, Finland and Australia, universities are funded according to the type of student, the numbers and the output. In Australia, capital management plans have to be submitted to the central authority. Similarly, in the UK, higher education institutions have to have their accommodation strategies cleared. But there is a general trend for institutions themselves to want accurate information about their own resources of space and its use.

In Spain, it is the ministry's architects who set the criteria : there are no formal norms. In France, norms are part and parcel of the tradition and are revised periodically - the latest revision came into operation in 1996. For Sweden, with its new policy of property holding by government agency, norms have become

important as the basis of public funding. But once the global figure is agreed between university and property holding agency it is up to the university to dispose of space as it wants.

In Greece, which provides the dramatic example quoted below, space needs tend to reflect the perceived needs of each project. In part this ties in with a steadily vanishing tradition of professorial power, when wishes would be unquestioningly translated into action. Given the policy of university creation evoked earlier, in which university planning is linked in with larger planning issues, space hierarchies may not be the most important issue except in the overcrowded old universities.

The first-ever space audit of the National Technical University of Athens (NTUA) was such a case, undertaken to speed up a process of moving the university out of its original and prestigious city centre site to the Zografou campus. The application of space weighted criteria, in a context in which space use had hitherto been determined by the wishes of the professor concerned, resulted in a potential space saving of half the planned gross floor area of a new site (50 000 sq. m.) leaving almost all the old city site for cultural and social activities - and the Department of Architecture.

The more intensive use of university property is another subject of general concern. There is a general trend towards longer opening hours for libraries and IT facilities. In Finland, students are charged for using library and computer facilities. Fees are charged differentially - off peak Monday is cheaper than midweek. In the UK, the University of Warwick is a leader in the field of out of term use of university premises, with conference lettings.

As the Crete conference debate underlined, there is increasing international interest in questions of location and how to stimulate links with local life at all levels from research partnerships to dual use of accommodation and equipment.

PHYSICAL RESOURCE MANAGEMENT - SWEDEN

Jan Ivar MATTSON, Vice-President, Buildings Office, Uppsala University, Sweden

Since 1918, *Byggnadsstyrelsen* (The National Board of Public Buildings) was the government authority responsible for the construction and management of all state-owned buildings with the exception of certain special buildings, among them the universities' premises, which were administered by the universities themselves.

However, in 1966, university buildings were also transferred to *Byggnadsstyrelsen*. Although government and parliament decided on most investments, in practice *Byggnadsstyrelsen* had a decisive influence. All plans and all floor space standards were set by this authority.

In 1993, the buildings were transferred to *Statliga Akademiska Hus* AB (Academic Buildings, Ltd.), a limited-responsibility company which is entirely owned by the government. In theory, this would open the possibility of competition with privately owned real-estate companies. However, this is not entirely the case in practice as *Akademiska Hus* owns all the existing campus grounds where the universities' expansion should take place.

Since 1970, universities as well as all other government authorities have to pay rent for their premises. This rent was calculated according to construction investment. The universities were given money to pay the rent by a grant which was expressly designated for this purpose. In 1992, the system of grants was completely remodelled.

The existing separate grants – eight for education, nine for research, one for rent and one for equipment and furniture – were replaced by only two new ones, one for education and one for research, each comprising costs for rent by government or *Byggnadsstyrelsen* in order to rent or even to build new facilities. The decision, and the financial responsibility, is entirely up to the university. The only restriction is that the university may not own real estate. Therefore, the premises of the university are all rented from *Akademiska Hus* AB or other landlords.

Obviously, this fresh-won freedom makes new demands upon the internal organisation of universities, especially in three fields :

- the ability to make decisions regarding the distribution of grants among the various activities of the university (including unpopular decisions);
- the establishment of long-term plans for the development of the university, including its physical situation;
- the establishment of a system of internal regulations to replace the now-defunct national regulations.

One could add that almost all Swedish universities have taken advantage of the situation to charge departments for the costs of their premises. This should provide them with a powerful inducement to save space. Although the new system has been in place for only a few years, the three organisational changes mentioned above have slowly begun to materialise at Uppsala and have vitalised discussions about the future.

A SPACE AUDIT - GREECE

Kostas Papadimitriou, General Secretariat for Research and Technology and Antonis Vezyroglou, National Polytechnic (Metsovio), Athens, Greece

Twenty years after the approval of the development plan for the Zografou campus of the National Technical University of Athens (NTUA), the institution

decided to carry out an assessment of the value of the buildings that had been completed. At that point in time the completion rate was about half of those originally planned. The assessment was based on an analysis of space utilisation, together with an analysis of needs. The results were astonishing. It was calculated that there could be a dramatic saving of 50 000 square meters. This was no less than half of the extended surface area as originally planned.

The Patission Campus

This space audit was influenced by increasingly restrictive public financing. The space saving plan has the following objectives :

- optimal utilisation of the buildings already constructed or in the process of construction;

- the application of requirements to users of the university's rooms, according to the type of space they use;

- a much quicker transfer of activities of eight out of nine NTUA departments to the new campus.

The Department of Architecture opted to remain in the downtown area and to participate along with the neighbouring Archaeological Museum in a renovation programme of the old NTUA facilities in Patission Street. This entailed a major development project which was to offer the city a 240 m. by 260 m. site for various activities including :

- educational activities : the Department of Architecture, rooms for exhibitions and meetings;

- cultural activities : the national Archaeological Museum, the Library of

84 Architecture and Plastic Arts;

- social activities : a congress centre, university-student residences, a hostelry for visiting professors, artists' studios, a restaurant, cafés, and a gymnasium.

The Zografou Campus

1. Civil engineering
1a. Civil engineering extension
2. Surveying engineering
2a. Surveying engineering extension
3. Mining engineering and metallurgy
4. Electrical engineering and computers
5. Chemical engineering
6. Mechanical engineering
7. Naval architecture and marine engineering
8. General studies
9. Architecture (indicatively)
10. Central functions
11 and 11a. Athletic centre
12. Student housing
12a. Student housing extension
14. Church
15 Children's day-care centre
16. Artificial lake

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11 and 11a. Athletic centre
12. Student housing
12a. Student housing extension
14. Church
15 Children's day-care centre
16. Artificial lake

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4

SUMMARY AND CONCLUSIONS

Almost everyone at Rethymnon wanted to see a world where buildings had become sufficiently flexible to allow for whatever developments are to come from IT for teaching and non-teaching areas. Many foresee "smart cards" becoming an important tool for management and administration.

But for many there was a more humanist dream : the university more effectively open to its local environment, the physical quality emphasised by good architecture, a more humanised approach to teaching than has been possible in recent crowded years in many higher education institutions, lifelong learning being fully integrated as a university function. A sense, in short, that tertiary education can offer equality of opportunity.

For the designers and managers of facilities and premises, that means how to ensure total quality management at all stages, how to develop initiatives, and how to work for continuous improvement with the relevant interest groups without losing sight of the objectives for which higher education is known.

In the short term, PEB can expect to be looked on to stimulate the exchange of information on the three big areas of discussion at the conference - tertiary education in its environment, the impact of IT, and better management. The question of libraries and resource centres - not much discussed at the conference - is seen as urgent.

But the challenge for all those concerned with facilities for higher education will be how to work with the academics who make the full range of tertiary education what it is. Will they be ever more watchful as to how to preserve the "academic core" which is the essential characteristic of the traditional university? Observers of international educational trends will continue to raise the question as to whether academic autonomy is compatible with the growing diversity and shifts in perception now visible, with varying degrees of clarity in many OECD Member countries, which are enabling the state to simultaneously disengage but demand more accountability.

In the search for the greater effectiveness, which will stave off the more disagreeable features of present trends, the professionals who find PEB a forum have a crucial role to play.

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Within the space of two decades, institutions have recorded an unprecedented increase in student numbers. What are governments' strategies for coping with this increase? Do they rely on new buildings or on greater intensity of use of existing facilities? In what ways do information technologies affect the need for buildings and equipment?

As higher education moves into a new millennium, new problems emerge and politicians, planners and architects must come up with appropriate solutions. These will have to take into account factors such as the location of facilities (whether in urban, suburban or rural areas) and the characteristics of the surroundings (classical, industrial or natural). This report draws on the expertise of professionals involved in the planning, design, construction or management of tertiary education facilities from a diverse range of OECD Member countries, and provides state of the art approaches and a selection of case studies.

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